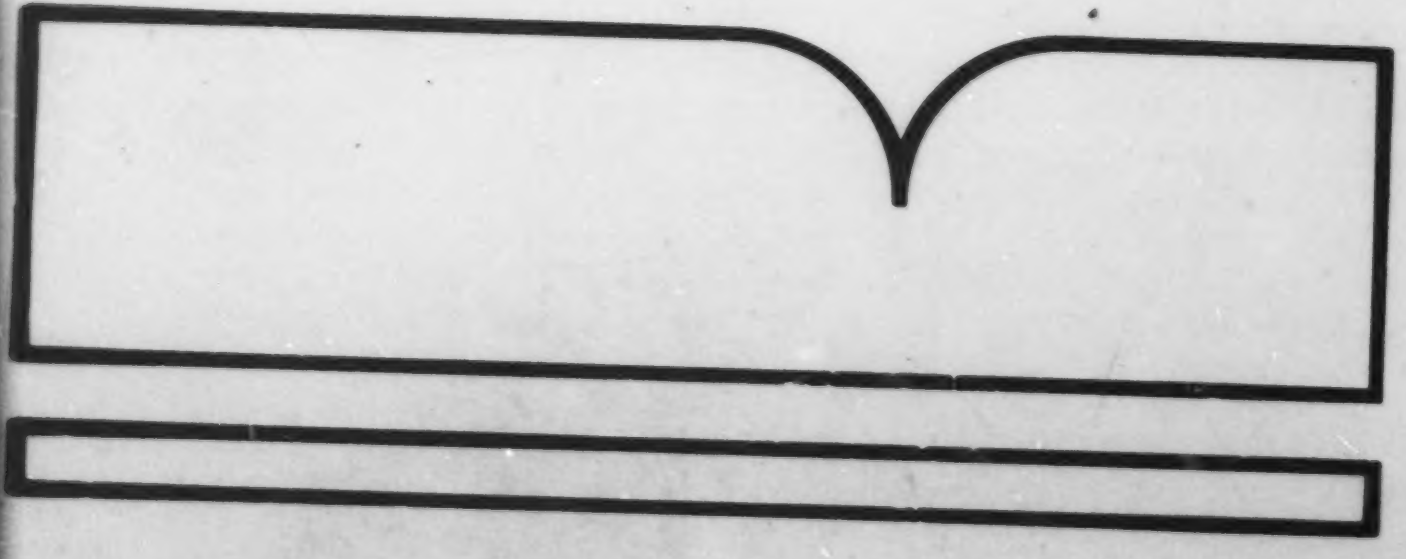
PB90-231234

Superfund Record of Decision (EPA Region 4)
Stauffer Chemical/Cold Creek, AL. (First Remedial Action)
September 1989

(U.S.) Environmental Protection Agency, Washington, DC

27 Sep 89



U.S. Department of Commerce
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United States
Environmental Protection
Agency

Office of
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Remedial Response

EPA/ROD/R04-89/057
September 1989

EPA

PB90-231234

Superfund Record of Decision:

Stauffer Chemical/Cold Creek, AL

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
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SPRINGFIELD, VA 22161

50272-101

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15. Supplementary Notes			14.

16. Abstract (Limit: 200 words)

The Stauffer Chemical Cold Creek Site is in Bucks, Mobile County, Alabama, approximately 20 miles north of Mobile, Alabama. The area is predominantly industrial, with a few small rural residential communities within a few miles of the site. The Mobile River borders the site to the east. The Cold Creek plant began operating in 1966 under the ownership of the Stauffer Chemical Company and is currently owned and operated by ICI Americas, Inc. Until 1974, an unknown amount of sludges and solid wastes containing a variety of herbicides and pesticides were placed in two waste disposal sites, referred to as the Cold Creek North and South Landfills. Both were closed in 1974 with geomembrane caps and side-wall liners. One clay-lined lagoon was used for neutralization of wastewater until 1975, and was closed in 1978. A new membrane-lined pond was constructed to replace it and is currently in use. Under a consent agreement with EPA, Stauffer completed a remedial investigation in May 1988, which identified contamination of the soils, pond sludges, swamp sediments, and ground water. Although there are four media of concern at the Stauffer Site, this remedial action addresses the contaminated ground water, because ground water is the source for drinking water for the area. Additional Records of Decision are planned for the source control operable units and the Cold Creek Swamp. The primary contaminants of concern affecting the ground water are VOCs including carcinogenic compounds such as carbon tetrachloride, and other organic compounds including pesticides. (Continued on next page)

17. Document Analysis a. Descriptors

Record of Decision - Stauffer Chemical/Cold Creek, AL
First Remedial Action
Contaminated Medium: gw
Key Contaminants: VOCs (carbon tetrachloride), other organics (pesticides)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 64
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) See Instructions on Reverse

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EPA/ROD/R04-89/057
Stauffer Chemical/Cold Creek, AL

16. Abstract (Continued)

The selected remedial action for the ground water operable unit at this site includes a modified ground water intercept and treatment system with surface water discharge. This alternative involves continued operation of the existing intercept and treatment system, which consists of aeration via spray nozzles with discharge to a treatment pond and then to the Mobile River; installation of additional extraction wells, based on ground water quality characteristics, water-table gradients, and pumping activities at the site and adjacent properties; design and implementation of modifications to the treatment system; and monitoring of effluent, ground water concentrations, and pumping rates. Further investigation and treatability studies are necessary before EPA can determine the remedial action for the source units (soil and pond sediment) and the swamp. Bench and/or pilot-scale testing of in-situ treatment alternatives for some of the source units, such as a wastewater treatment pond, is appropriate as part of the Remedial Design. A range of treatment technologies including thermal desorption and vapor extraction is being considered. The estimated total capital cost for this remedial action is $3,119,200, which includes O&M costs. Specific O&M costs were not provided.

8904 E

Record of Decision
Ground Water Treatment Operable Unit

Site Name and Location: Stauffer Chemical/LeMoyne - Axis, Alabama
Stauffer Chemical/Cold Creek - Bucks, Alabama

Statement of Basis and Purpose:

This decision document presents the selected remedial action for the Stauffer Chemical LeMoyne and Cold Creek Sites, in Mobile County, Alabama, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (40 CFR 300). The decision is based on the administrative record for the sites. The attached index identifies the items that comprise the administrative record upon which the selection of the remedial action is based.

The State of Alabama has concurred on the selected remedy.

Site Assessment

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

This initial ground water operable unit is the first of three planned for the Stauffer sites. It addresses a principal threat at the sites by controlling the migration of contaminants present in the surficial aquifer. The operable unit is fully consistent with all planned future site activities. Future site activities include treatability studies or piloting of treatment technologies for the source control and swamp operable units, which will comprise the overall site remedy.

The major components of the selected remedy are as follows:

- Modify existing ground water intercept and treatment system; install additional monitoring (Detection Monitoring) and extraction wells
- Continue extracting ground water from the surficial aquifer via existing and additional intercept wells
- Monitor ground water movement at the site to determine the adequacy of the remedial action
- Conduct treatability studies as appropriate for source treatment of RCRA Solid Waste Management Units (SWMUs) and CERCLA disposal sites
- Decommission wells no longer needed for monitoring

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

SEP 27 1989
(Date)

Lee G. Dehaven III for
Greer C. Tidwell
Regional Administrator

Record of Decision

Summary of Remedial Alternative Selection

Stauffer Chemical - LeMoyne and Cold Creek Sites

Axis and Bucks, Mobile County, Alabama

Prepared by:
U.S. Environmental Protection Agency
Region IV
Atlanta, Georgia

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Summary of Remedial Alternative Selection
Stauffer Chemical/LeMoyne Site
Ground Water Operable Unit

1.0 SITE LOCATION AND DESCRIPTION

The Stauffer Chemical LeMoyne and Cold Creek Sites (See Figure 1.1) are located approximately 20 miles north of Mobile, Alabama on U.S. Route 43. The Stauffer complex is bounded by Hoerchst Celanese to the north, Courtaulds North America (CNA), another chemical company, to the south, the Mobile River to the east, and Route 43 to the west. M&T Chemicals is located immediately to the west of Route 43. The area is predominantly industrial, with a few small rural residential communities within a few miles of the site. The LeMoyne facility manufactures multi-product organic and inorganic chemicals, including carbon disulfide, carbon tetrachloride, sulfuric acid, chlorine, and crystex (a sulfur compound).

Surface elevations range from 10 to 45 feet above MSL. An unnamed stream flows north across the property and then through the Cold Creek Swamp, which discharges into the Mobile River. Surface-water drainage is either toward the swamp or the river and is governed by a drainage divide between the two. The Mobile River flows southward toward the Gulf of Mexico.

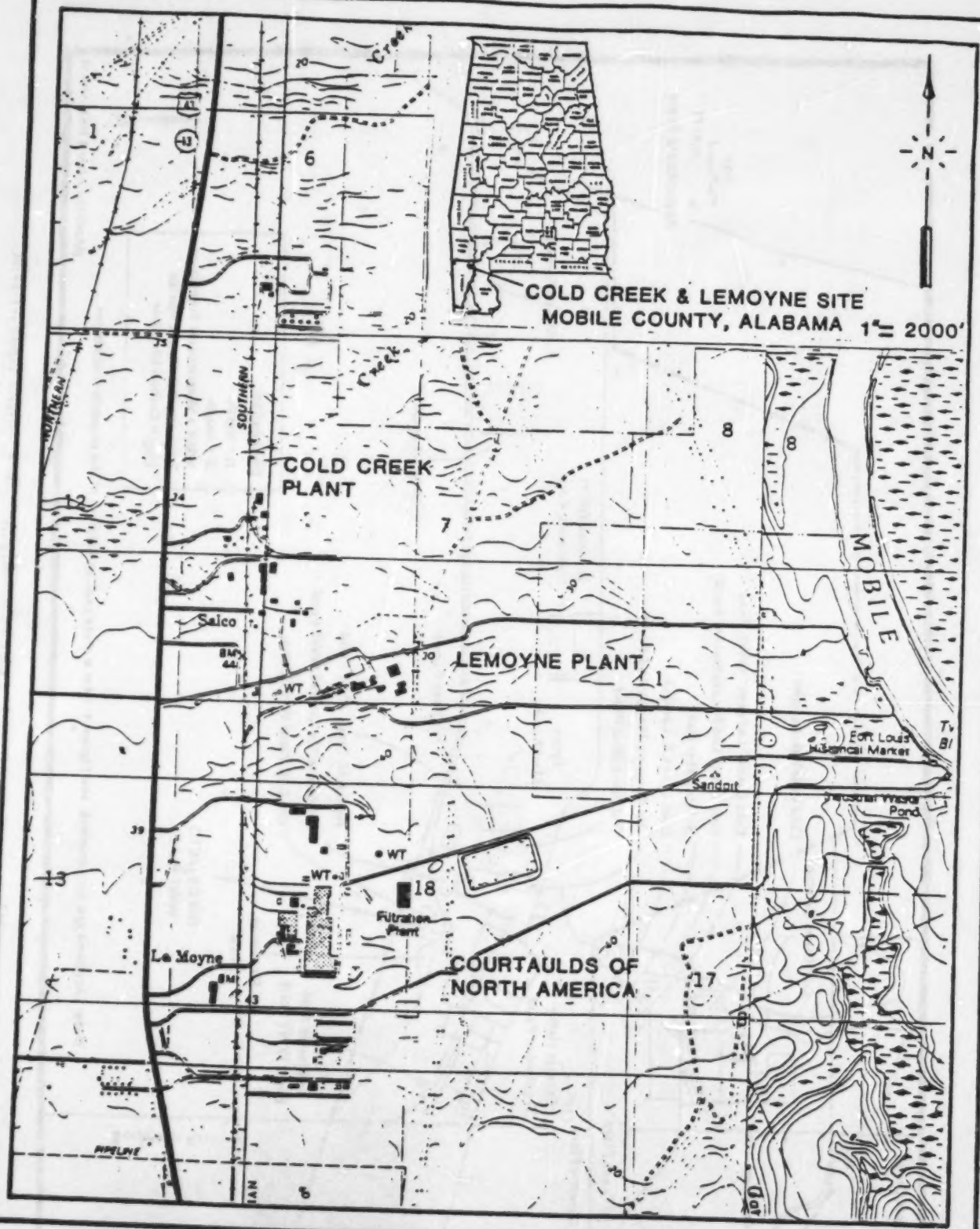
2.0 SITE HISTORY

2.1 LeMoyne

The LeMoyne plant was previously owned by the Stauffer Chemical Company, which began operations in 1953. In 1987, the facility was purchased by Akzo Chemie America, Inc., now called Akzo Chemicals, Inc. From 1965 to 1974, while still operated by Stauffer, waste from the plant was placed in an unlined landfill (Figure 2.1) located approximately one mile east of the main plant. The waste included 11,000 to 12,000 tons of brine muds in addition to plant refuse, used samples, and absorption oil. Under the direction of the Alabama Water Improvement Commission (AWIC), the landfill was closed in 1975 with an impermeable membrane cap and side-wall liner.

Wastewaters from the LeMoyne plant processes were held in ponds, some of which discharged to the Cold Creek Swamp. All of these ponds except for one are clay-lined and have been closed under the direction of AWIC. Several membrane-lined ponds, which are currently active, were installed during the 1970's to replace those mentioned above. One of these is regulated by a Resource Conservation and Recovery Act (RCRA) permit.

From 1965 to 1979, a small portion of land on the western end of the LeMoyne site was leased by Stauffer to the Halby Chemical Company (HCC), which manufactured dye chemicals including sodium hydrosulfide. Witco, Inc. purchased the HCC facility in 1974, and continued to operate the plant until 1979. Although little is known of this operation, waste products and effluents were reportedly discharged to the Cold Creek Swamp and held in an on-site pond, which has since been closed and filled.



CAMP DRESSER & McKEE INC.

SITE LOCATION MAP

STAUFFER CHEMICAL COMPANY

MOBILE COUNTY, ALABAMA

FIGURE NO.

1.1

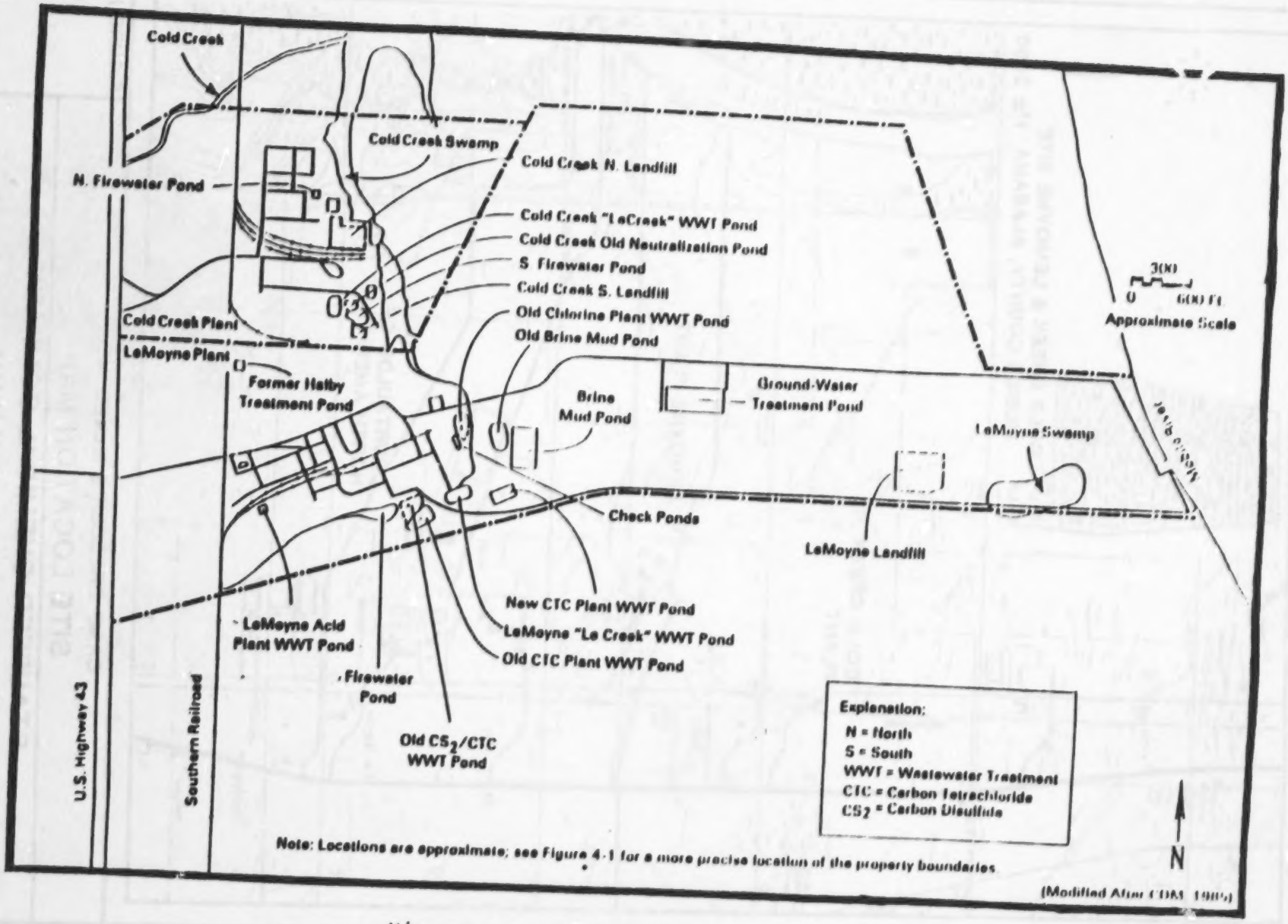


Figure 2.1 Cold Creek/LeMoyne Site Configuration

2.2 Cold Creek

The Cold Creek plant began operating in 1966 under the ownership of the Stauffer Chemical Company and is currently owned by ICI Americas, Inc. Until 1974, an unknown amount of sludges and solid wastes containing a variety of herbicides and pesticides were placed in two waste disposal sites, referred to as the Cold Creek North and South Landfills. Both were closed in 1974 with geomembrane caps and side-wall liners. One clay-lined lagoon was used for neutralization of wastewater until 1975. It was closed in 1978. A new membrane-lined pond was constructed to replace it and is currently in use.

2.3 Enforcement History

The aforementioned disposal practices led to ground water contamination. This was recognized by Stauffer and the Alabama Department of Environmental Management (ADEM) in the early 1970's when contaminants were detected in both on-site and off-site wells. Several improvements and waste-handling modifications were made including the construction of lined wastewater ponds and the closure of some of the old unlined ponds. In 1973, Stauffer installed twenty-one ground water monitoring wells. By 1977, the water quality had deteriorated substantially and seven observation wells were placed at the southern property line of the LeMoyne facility. Using the results from a hydrogeological investigation performed by the owner/operator, three interceptor wells accompanied by an air stripper were installed on the LeMoyne property in late 1980. The system was approved by the Alabama Water Improvement Commission (AWIC) which is now the Alabama Department of Environmental Management (ADEM).

An assessment of the site was conducted in 1982 by the Alabama Department of Public Health (ADPH) in response to submissions made by Stauffer to the House Committee on Interstate Commerce (the Eckhardt Survey). At the advice of ADPH, additional monitoring wells were installed around the LeMoyne Landfill. Data from these wells formed the basis for the Environmental Protection Agency (EPA) placing the site on the National Priorities List (NPL), which ranks hazardous disposal sites under provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), commonly known as "Superfund". The Stauffer Sites were placed on the NPL in September, 1983. LeMoyne is ranked number 467 and Cold Creek is number 221.

In November 1984, EPA Region IV sent a general notice letter to Stauffer Chemical Company notifying them of potential liability for contamination at the Stauffer Chemical Site. Camp, Dresser and McKee, Inc. (CDM), under contract with the EPA, performed preliminary sampling in May 1985 to assist in preparing a work plan for the Remedial Investigation/Feasibility Study (RI/FS). The Stauffer Chemical Company agreed to conduct the RI/FS under a consent agreement with EPA, and the present owners, Akzo and ICI, completed the RI in May, 1988. A draft FS report was submitted by the present owner/operator in July, 1988. EPA required modifications to the FS report in comment letters sent in November, 1988 and January, 1989. A revised report was submitted in June, 1989. This report was reviewed by EPA and was partially disapproved.

The Stauffer Chemical Company/LeMoyne Plant was issued a RCRA permit on October 9, 1986, which became effective November 9, 1986. The permit was for the operation of two hazardous waste surface impoundments and a hazardous waste storage tank.

Unit	Hazardous Waste Code
Brine Mud Slurry Tank	K071
Chlorine Plant Surge Pond	D009, K071
New Brine Mud Pond	K071
Old Brine Mud Pond	K071

The Chlorine Plant Surge Pond was certified clean-closed in September, 1988 according to the approved closure plan. The Old Brine Mud Pond has been delisted.

An additional provision was included in this permit as a result of the 1984 Hazardous and Solid Waste Amendments to RCRA. This is the requirement of 40 CFR, Section 264.101, which addresses prior or continuing releases at solid waste management units. The requirement has been satisfied by adoption of the Remedial Investigation/Feasibility Study work plan, developed under CERCLA, into the permit. The permit will be modified once the Record of Decision has been issued.

3.0 COMMUNITY RELATIONS HISTORY

Community interest for the Stauffer Chemical site has been limited. Several news articles concerning the site have been printed in the Mobile Press Register and the Montgomery Advertiser. A Community Relations Plan was completed in September, 1985. In May 1986, the EPA printed and distributed a fact sheet describing the site history and findings of investigations conducted at the site. A fact sheet announcing EPA's Proposed Plan was issued on July 11, 1989.

A related issue of concern to the people of Mobile County, Alabama is transport and disposal of wastes within their county. This concern arose as a result of a proposal to begin hazardous waste incineration in the Gulf of Mexico via the Mobile port.

On July 13, 1989, the administrative record which contains documents related to remedy selection at the site, including the Remedial Investigation/Feasibility Study, and Proposed Plan, was made available to the public at the Region IV EPA offices in Atlanta, Georgia and the Toulminville Branch Library in Mobile, Alabama. This began a 30-day public comment period to solicit public opinion on the proposed remedial action at Stauffer Chemical. A public meeting was conducted on July 27, 1989, at which EPA presented the RI/FS report and Proposed Plan and answered citizens' questions. The Mobile County Commissioners and County Administrator were briefed prior to the meeting. Public comments on the selected remedy and EPA's responses are included in the Responsiveness Summary section of this document. This decision document presents the selected remedial action for the Stauffer Chemical LeMoyne and Cold Creek sites in Mobile County, Alabama, chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the NCP. The decision for these sites is based on the administrative record file.

4.0 SCOPE OF REMEDIAL ACTION

OU 1: Ground Water and Contaminant Sources

This addresses the first Record of Decision (ROD) of several planned activities at the site. It deals with the existing ground water problem and treatability studies on the sources of contamination.

The response actions presented in this ROD are being implemented to protect public health and the environment by controlling the migration of contaminated ground water in the surficial aquifer, which is a principal source of water for industrial and domestic users located in the Mobile River Valley. The US EPA has determined that off-site migration of the contaminated ground water is one of the principal threats at these sites.

The response actions are consistent with the NCP (40 CFR 300.68). These actions are also consistent with plans for future remedial work to be conducted at the LeMoyne and Cold Creek sites.

Further investigation and treatability studies are necessary before the EPA can make decisions concerning treatment of source materials.

OU 2: Source Units

OU 3: Cold Creek Swamp

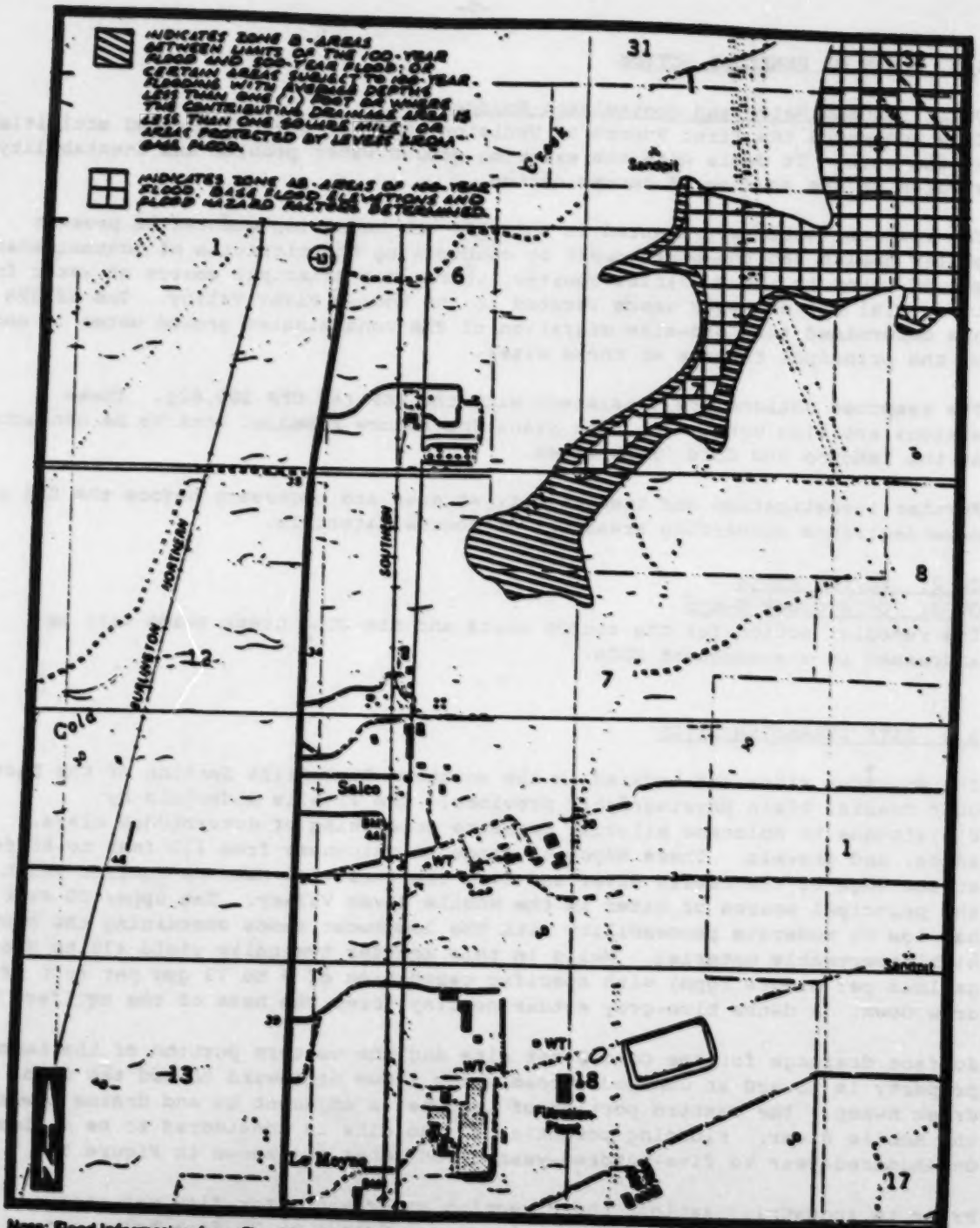
The remedial action for the source units and the Cold Creek Swamp will be addressed in a subsequent RODs.

5.0 SITE CHARACTERISTICS

The Stauffer sites are located in the southern Pine Hills Section of the East Gulf Coastal Plain physiographic province. The site is underlain by Pleistocene to Holocene alluvial deposits consisting of interbedded clays, sands, and gravels. These deposits range in thickness from 130 feet to 60 feet at the edge of the Mobile River and form the surficial Miocene aquifer which is the principal source of water in the Mobile River Valley. The upper 80 feet has low to moderate permeability with the lowermost sands containing the most highly permeable material. Wells in this aquifer typically yield 470 to 816 gallons per minute (gpm) with specific capacities of 6 to 73 gpm per foot of draw down. A dense blue-grey estuarine clay forms the base of the aquifer.

Surface drainage for the Cold Creek site and the western portion of the LeMoyne property is toward an unnamed stream which flows northward toward the Cold Creek Swamp. The eastern portion of LeMoyne is adjacent to and drains toward the Mobile River. Flooding potential at the site is considered to be minimal. One-hundred-year to five-hundred-year flood zones are shown in Figure 5.1.

Prior to industrialization, the direction of ground water flow was eastward toward the Mobile River and its depth ranged from 0 to 20 feet below ground surface. Installation of wells on the adjacent Courtaulds property has resulted in a lowering of the water table to between 25 and 75 feet below ground surface. Furthermore, direction of ground water flow has been changed to southwest on the western portion of the site and to the southeast on the eastern portion. Most of the industries and local communities in the area



Note: Flood information from Flood Insurance Rate Map, Community Panel No. 015008 0125 F & 0150 F, Revised 1-3-85.

Topographic information Taken From USGS Topo Map, 1982.

Figure 5.1 - Flood Plain Map

obtain water supplied from the surficial aquifer.

As shown in Figure 1, the LeMoyne facility has two drinking water wells (LM-7 and LM-10) which provide water for 230 employees, and the Cold Creek plant has one drinking water well (CC-12) with one backup (CC-11), serving 250 employees. The CNA plant to the south has one primary drinking water well (CNA-16) and a backup well (CNA-4), serving 750 employees. M&T Chemicals, on the west side of Route 43, uses well water for their 200 employees. All of these wells draw water from the surficial aquifer.

The Remedial Investigation, conducted by the owner/operator under a consent agreement with the EPA, was divided into two major subtasks - source and area characterization. Source characterization was performed by soil sampling around the landfills and ponds, and sampling of pond liquids. Ground water sampling of two newly installed and thirteen existing monitoring wells was also conducted. All of these wells were analyzed for location-specific compounds, and three of them were also analyzed for priority pollutants. Area characterization involved sampling 36 site area wells for location-specific compounds. Seven of the 36 wells were also analyzed for priority pollutants. In addition, two surface water samples and two soil samples were collected off-site to determine background concentration of the contaminants of concern. Well locations are shown in Figures 5.2 and 5.3, and results of the sampling and analysis are summarized in Table 5.1.

As a result of the above analysis, ten areas were identified as possibly needing remediation. These included five inactive ponds, three landfills, the Cold Creek Swamp, and the ground water. The ponds and landfills are classified as Solid Waste Management Units (SWMUs) under RCRA regulations. EPA has grouped these units into nine Solid Waste Management Unit Areas. They are as follows:

SWMU Area #1 - Cold Creek LeCreek Wastewater Treatment Pond
Cold Creek Old Neutralization Pond
Cold Creek South Landfill

SWMU Area #2 - Old Carbon Disulfide Wastewater Treatment Pond
Old Carbon Tetrachloride Plant Wastewater Treatment Pond

SWMU Area #3 - Cold Creek North Landfill

SWMU Area #4 - Old Brine Mud Pond

SWMU Area #5 - New Carbon Tetrachloride Plant Wastewater Treatment Pond

SWMU Area #6 - LeMoyne LeCreek Wastewater Treatment Pond

SWMU Area #7 - Old Chlorine Plant Wastewater Treatment Pond

SWMU Area #8 - LeMoyne Landfill

SWMU Area #9 - Halby Pond

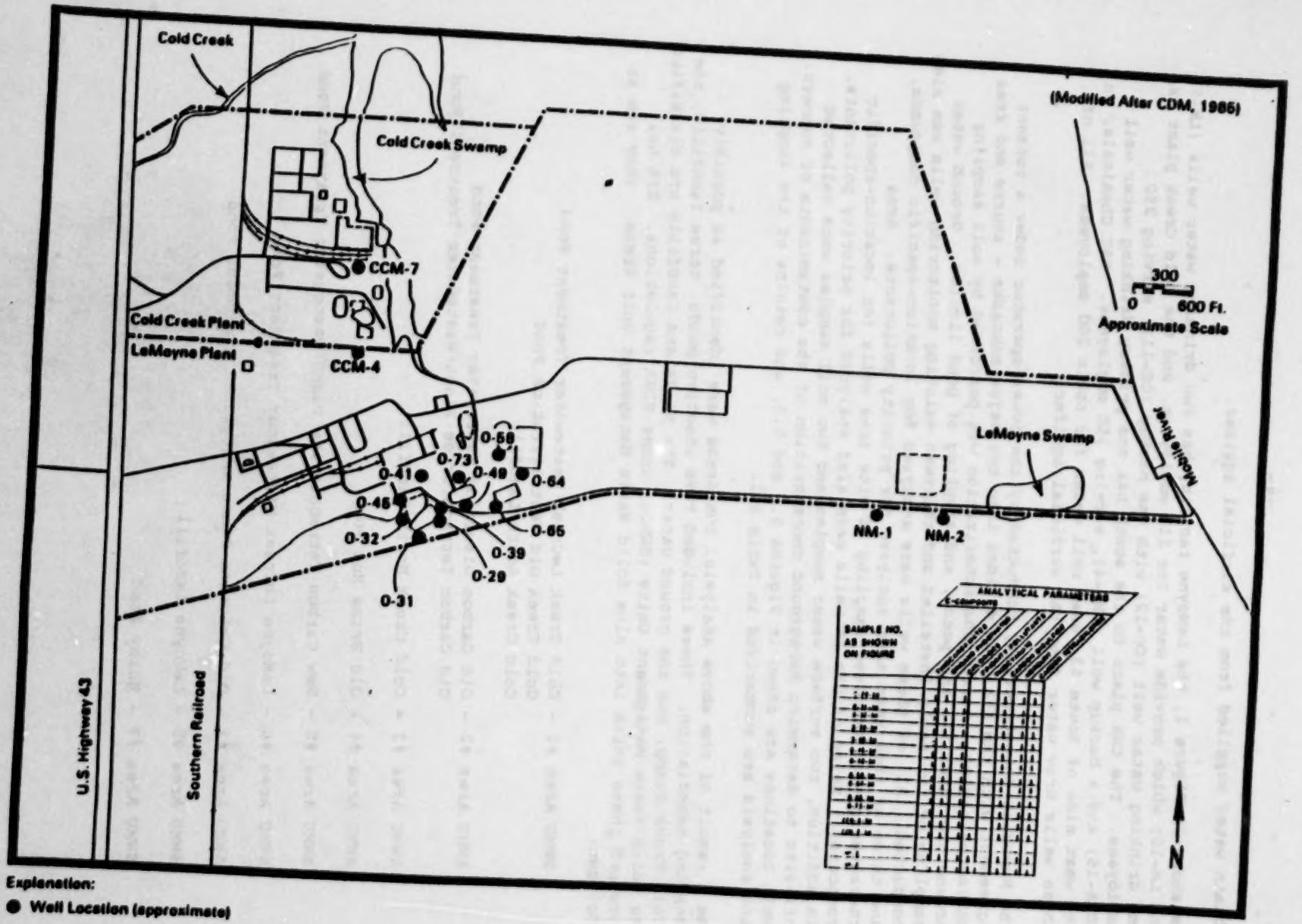


Figure 5.2 Source Well Sample Locations

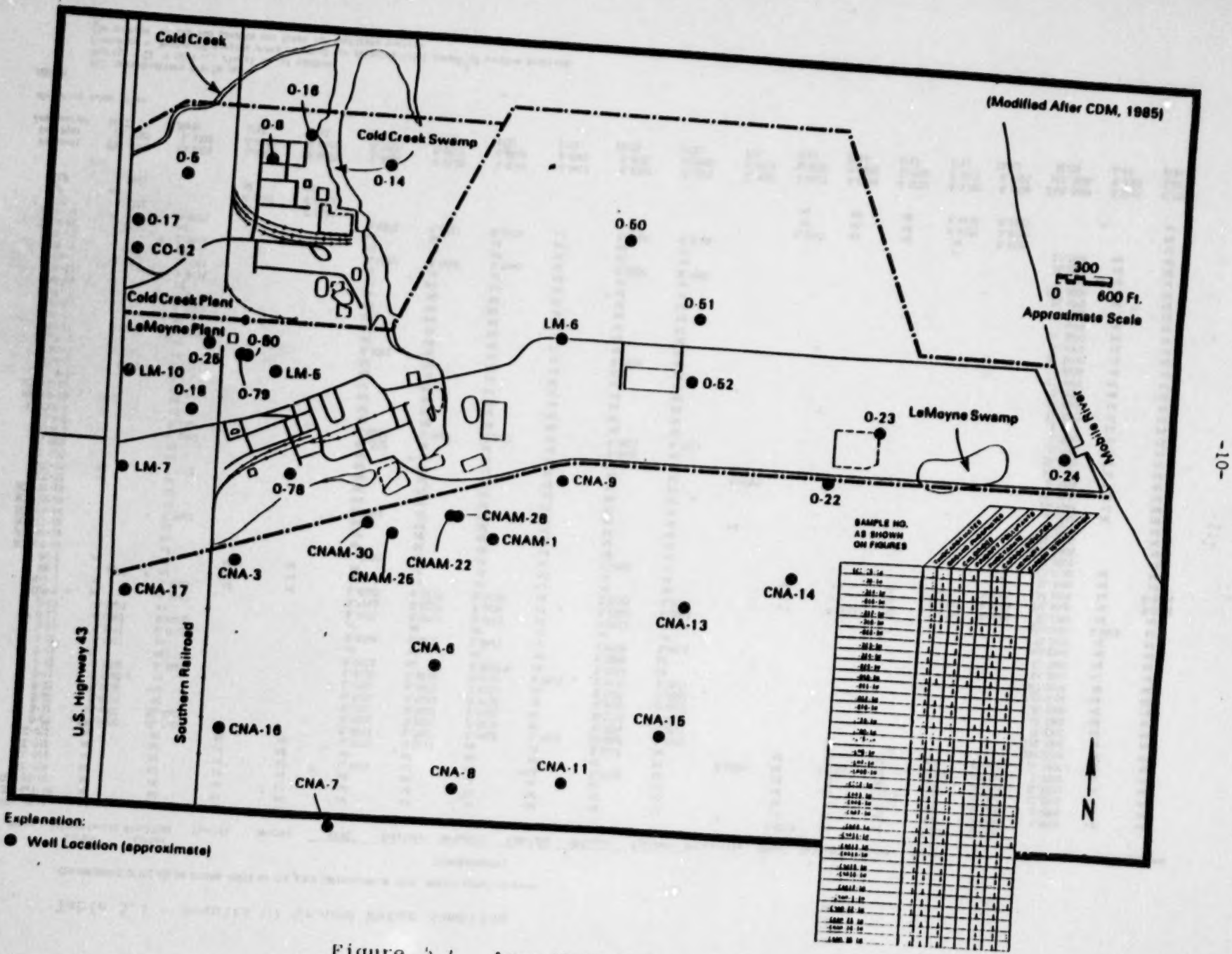


Figure 5.1 Area Well Sample Locations

Table 5.1 - Results of Ground Water Sampling

CONTAMINANTS DETECTED IN GROUND WATER AT THE COLD CREEK/LEMMON SITE, MIDDLE (EARLY SPRING)

Wells	Carbon Tetrachloride	Carbon Disulfide	Cyanide	Mercury	Pesticides: EPTC	Butylate	Vernolate	Fabulate	Ashlade	Cycloate	Thiocyanate	Phenol	Arsenic	Copper	Nickel	Zinc	Chloride	Fluoride	Chloroform
*DCC-CC12	nd		nd	nd								0.0059	nd	nd	0.0160	0.0630			
DCC-017-1W	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		nd	nd	nd	nd	0.0260	4.8000	nd	nd
DCC-03-1W	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		nd	nd	nd	nd	0.1700	9.7000	nd	nd
DCC-050	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		nd	nd	0.0220	nd	0.0520	45.0000	nd	nd
DCC-014	nd	nd	nd	nd	0.0014	nd	nd	nd	0.0022	nd		nd	nd	nd	0.0140	0.1100	16.0000	nd	nd
DCC-018	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.4000	nd	0.0110	nd	0.0130	0.0560	5.3000	nd	nd
DCC-016	290.0000	22.2000			0.0059	0.0013	nd	nd	0.0015	nd		nd	nd	nd	nd	0.1000	26.4000	nd	nd
P-29	62.6000	55.6000			0.0049	0.0022	0.0065	0.0019	0.0088	0.0026							330.0000	nd	nd
P-31	0.0014	nd			0.0056	0.0025	0.0028	nd	0.0080	0.0021							110.9000	nd	nd
P-32	1.0020	nd			0.0097	0.0030	0.0026	nd	0.0100	0.0029							25.2000	nd	nd
P-79	0.0120	nd			0.0056	0.0023	0.0032	nd	0.0085	0.0023							60.3000	nd	nd
P-41	1.2200	0.3680			0.0051	0.0022	0.0023	nd	0.0071	0.0022							36.3000	nd	nd
P-43	nd	nd			0.0130	0.0100	0.0087	0.0010	0.0170	0.0071							129.9000	nd	nd
P-58	0.0011	nd			0.0023	nd	0.0010	nd	0.0042	nd							367.0000	nd	nd
P-64	0.0011	0.0002			nd	nd	nd	nd	0.0030	nd							64.2000	nd	nd
P-65	0.0012	0.0002			0.0040	0.0012	0.0021	nd	0.0100	0.0018							61.5000	nd	nd
P-72	0.0020	nd			nd	nd	nd	nd	nd	nd							169.2000	nd	nd
P-4	nd	0.0003			0.0051	0.0014	0.0018	nd	0.0073	0.0019							153.3000	nd	nd
P-7	nd	0.0005			0.0013	0.0027	0.0046	nd	0.2310	0.0033							233.0000	0.0010	nd
EW-1	0.0245	nd	nd	nd	0.0180	0.0135	0.0039	nd	0.0245	0.0040		nd	0.0280	nd	0.0120	0.0800	91.3000	nd	nd
EW-2	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		nd	nd	nd	0.0330	0.0580	332.0000	nd	0.0515
EW-10-1W	nd	nd	nd	nd	1.2000	nd	nd	nd	0.0029	nd		nd	nd	nd	nd	0.0229	22.1000	nd	0.0030
EW-10-2W	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							41.3000	nd	nd
EW-23-1W	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							123.6000	nd	nd
EW-23-2W	nd	0.0012	nd	nd	nd	nd	nd	nd	nd	nd							37.8000	nd	nd
EW-23-3W	nd	nd	nd	nd	0.0010	nd	nd	nd	nd	nd							2900.0000	nd	nd
EW-21-1W	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd						23.9000	nd	nd
EW-21-2W	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							2.4000	nd	nd
EW-78	nd	0.0002	nd	nd	nd	nd	nd	nd	nd	nd							2.7000	nd	nd
EW-075	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	6.0000						20.9000	nd	nd
EW-080	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd						16.8000	nd	nd
EW-1	nd	0.0008	nd	nd	0.0570	nd	nd	nd	0.0051	nd							6.8930	nd	nd
EW-4	nd	0.2320	nd	nd	0.0047	0.0014	0.0021	nd	0.0054	0.0013							17.4000	nd	nd
EW-7	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							58.4000	nd	nd
EW-10	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							4.7000	nd	nd
EW-12	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							7.9700	nd	nd
DW-1	nd	0.0003	nd	nd	nd	nd	nd	nd	nd	nd							3.4000	nd	nd
DW-4	0.0009	0.0063	nd	nd	nd	nd	nd	nd	nd	nd							37.9000	nd	nd
DW-7	0.0145	nd	nd	nd	nd	nd	nd	nd	nd	nd							25.9000	nd	nd
DW-9	nd	nd	nd	nd	0.0021	nd	nd	nd	0.0034	nd							5.6000	nd	nd
DW-11	0.0007	0.0005	nd	nd	nd	nd	nd	nd	nd	nd							37.4000	nd	nd
DW-13	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							17.8000	nd	nd
DW-14	nd	0.0024	nd	nd	nd	nd	nd	nd	nd	nd							62.6400	nd	nd
DW-15	nd	0.0005	nd	nd	nd	nd	nd	nd	nd	nd							96.6400	nd	nd
DW-16	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd							11.3000	nd	nd
DW-17	nd	0.0434	nd	nd	nd	nd	nd	nd	nd	nd							3.0400	nd	nd
DWM-1	0.0176	0.0007	nd	nd	nd	nd	nd	nd	nd	nd							4.7000	nd	nd
DWM-2	nd	nd	nd	nd	0.0210	0.0068	0.0075	nd	0.0260	0.0057							23.4000	nd	nd
DWM-3	nd	0.0010	nd	nd	nd	nd	nd	nd	nd	nd							260.0000	nd	nd
DWM-8	0.0070	nd	nd	nd	nd	nd	nd	nd	nd	nd							6.2000	nd	nd
DWM-30	nd	0.0006	nd	nd	0.0070	0.0021	0.0020	nd	0.0260	0.0013							21.2000	nd	nd
MCTC	0.0323		nd	0.0003								0.0075	nd	nd	nd	0.0120	53.7000	nd	nd
ELP	nd		0.1320	0.0008								nd	nd	nd	0.0220	0.0230			
ELP	0.0006		nd	nd								nd	nd	nd	0.0130	0.1600			
Maximum:	290.0000	55.6000	0.1320	0.0008	1.2000	0.0135	0.0087	0.0019	0.2310	0.0071	6.0000	0.0075	0.0280	0.0220	0.0330	0.1700	2900.0000	0.0010	0.0515
Average:	10.4250	1.5365	0.0102	0.0001	0.0270	0.0010	0.0010	0.0001	0.0081	0.0008	1.0647	0.0010	0.0030	0.0016	0.0095	0.0725	143.7686	0.0000	0.0011
Frequency:	18/33	20/51	1/12	2/13	20/51	14/51	14/51	2/51	20/51	13/51	2/4	2/13	2/13	1/13	7/13	13/13	51/51	1/47	2/34

*Drinking water wells

NOTES:

All concentrations are in ppm
Average = C1 + C2 + ... /total no. of samples
Frequency = Number of samples where compound was detected/Total number of samples analyzed.
The average of the two samples was taken for duplicate samples.

6.0 SUMMARY OF SITE RISKS

The following discussion provides an overview of the baseline public health and environmental risk evaluation for the Stauffer LeMoyne and Cold Creek Sites. It is based on the report "Endangerment Assessment Report Cold Creek/LeMoyne Site, Mobile County, Alabama", prepared by the owner/operator. The baseline evaluation helps determine if a remedial action is necessary at the sites. It represents an evaluation of the "no-action alternative", in that it identifies the risk present if no remedial action is taken. The baseline assessment also provides the framework for developing the preliminary remediation goals for the Stauffer sites. Field observations and analytical data as presented in the Remedial Investigation report provided the basis for the risk evaluation. There are four media of concern at the Stauffer Site. The Remedial Investigation revealed contamination of the soils, pond sludges, swamp sediments, and ground water.

Based on the frequency of detection, the concentrations detected, and the toxicological properties of the contaminants which were detected, the following compounds were selected as indicator compounds for this site: mercury, carbon tetrachloride, carbon disulfide, cyanide, thiocyanate, and six thiocarbamates, EPTC, butylate, vernolate, pebulate, molinate, and cycloate. Of these compounds, all but mercury and cyanide were detected in the ground water. A table showing the concentrations of these substances in ground water and the associated risk can be found at Table 6.1.

The ground water data used to calculate the baseline risk assessment were collected from wells downgradient of the intercept well system. The baseline risk assessment should reflect the conditions for the no action alternative, which would exist if the intercept and treatment system were shut down. Since the risk levels in the RI do not represent these baseline risk conditions at the sites, risk levels have been calculated for the ROD which represent the worst case and average case scenarios.

6.1 Exposure Assessment Summary

The exposure pathway for the ground water operable unit is ingestion of contaminated water from wells drilled into the surficial aquifer. Average and worst-case risk estimates were developed for a 70 kg adult worker. The exposure point concentration for the worst case scenario is based on the consumption of ground water containing the maximum contaminant concentration. The average exposure point concentration is based on the consumption of ground water containing the average concentration of contaminants in the ground water plume (i.e. wells O-29, O-31, O-39, O-41, O-45). Both estimates assumed the worker would drink two liters of water a day for 30 years and used an absorption factor of one (1.0) for organics and inorganics.

The number of workers served by industrial drinking water supply wells within a two-mile radius of the sites is 1585. There are 21 residential wells within that radius.

TABLE 6.1 - GROUND WATER CONTAMINANTS OF CONCERN

Carcinogens	CPF ($mg/kg-day^{-1}$)	Maximum Concentration (mg/l)	Mean Concentration (mg/l)	Risk Level Max./Mean
Carbon Tetrachloride	1.3×10^{-1}	298	68.8	4.6×10^{-1} / 1.07×10^{-1}

* Risk Level is for a 30 year exposure period

Noncarcinogens	RfD ($mg/kg-day^{-1}$)	Maximum Concentration (mg/l)	Mean Concentration (mg/l)	Hazard Quotient Max./Mean
Carbon Disulfide	1×10^{-1}	55.6	15.6	155/4.4
Carbon Tetrachloride	7×10^{-4}	298.0		11920/2752
Thiocyanates	NE	6.0	ND	
Butylate	5×10^{-2}	0.014	0.004	7.84×10^{-3} / 2.2×10^{-3}
Cycloate	NE	0.007	0.003	
EPTC	3×10^{-2}	1.2	0.006	1.1/ 5.6×10^{-3}
Molinate	2×10^{-3}	0.231	0.010	3.2/ 1.4×10^{-1}
Pebulate	NE	0.002	0.001	
Vernolate	1×10^{-3}	0.009	0.008	2.5×10^{-1} / 2.2×10^{-1}

NE - None established

ND - Not detected in the wells used for determining the average exposure point concentration.

6.2 Toxicity Assessment

Chemicals exhibiting non-carcinogenic effects are assessed using risk reference doses (RfDs) developed by the EPA. The RfD, expressed in units of mg/kg/day, is an estimate of the average daily exposure of individuals (including sensitive individuals) which will result in no adverse health effects during their lifetime. Exposure levels to contaminants in environmental media such as drinking water are compared to the RfD, which provides a benchmark below which adverse health effects are not expected to occur.

Agency verified RfDs are available for six (6) of the substances identified in the ground water at the sites: carbon disulfide, carbon tetrachloride, and four (4) thiocarbamate pesticides (butylate, EPTC, molinate, and vernolate) These values are contained in Table 6.1. At present there are no Agency verified RfDs for the individual thiocyanate compounds.

The EPA's Carcinogen Assessment Group has developed cancer potency factors for estimating excess lifetime cancer risks associated with exposure to potential carcinogens. The cancer potency factor, measured in $(mg/kg/day)^{-1}$, is multiplied by the average intake of a potential carcinogen (in mg/kg/day) to provide an estimate of the upper bound lifetime excess cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative nature of the risks calculated using the cancer potency factor, and they are therefore unlikely to be less than the actual cancer risks.

One of the substances at the site, carbon tetrachloride, has been classified by EPA as a class B2 carcinogen. The cancer potency factor for carbon tetrachloride is 1.3×10^{-1} $(mg/kg/day)^{-1}$.

6.3 Risk Characterization

This section quantifies the potential for adverse health effects due to site related chemical exposure. Because noncarcinogenic effects are assumed to have a threshold dose below which an adverse effect will not occur, and carcinogenic effects are assumed not to have a threshold dose, risk estimates for noncarcinogenic effects are determined separately from carcinogenic risks. The potential for noncarcinogenic health effects is assessed by dividing each indicator chemical's exposure-route and duration-specific intake by the reference dose (RfD). This ratio is called the Hazard Quotient (HQ). If the estimated intake is greater than the RfD, the HQ will exceed one (1). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

The HQ for many of the individual contaminants exceeds unity for the maximum exposure scenario, and the HQ for both carbon tetrachloride and carbon disulfide exceeds unity for the average exposure scenario.

Excess lifetime cancer risks are determined by multiplying the intake level and the cancer potency factor. These risks are probabilities that are expressed in

scientific notation. An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausable upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. The Agency considers individual cancer risks in the range of 10^{-4} to 10^{-7} as protective. The 10^{-6} risk level is used as the point of departure for setting cleanup levels at Superfund sites. The risk level associated with the maximum and average exposure to carbon tetrachloride is in the unacceptable range (i.e. 10^{-1}).

At the present time, individual exposure via the ingestion of contaminated ground water is not occurring. However, unacceptable risk levels for the baseline assessment indicate that ground water treatment is necessary to prevent the potential human exposure to unacceptable levels of contaminants in the future.

6.4 Environmental Risk

Environmental risk at the Stauffer LeMoyne and Cold Creek sites is present due to the threat of migration of ground water to the Mobile River. The area is a natural habitat for a variety of invertebrates, amphibians, reptiles, fish, birds and mammals. Two species of concern are the American Alligator, which is on the list of threatened species, and the Alabama Red-Bellied Turtle, which is proposed for the list. The adjacent Cold Creek site includes the Cold Creek Swamp for which the environmental risk will be addressed in the Record of Decision for the Swamp operable unit.

7.0 DOCUMENTATION OF SIGNIFICANT CHANGES §117(b)

The preferred alternatives for the ground water and source operable units as specified in the Proposed Plan is modification of an existing intercept and treatment system, monitoring of Detection Monitoring wells to determine the necessity for corrective action, and pilot testing of in-situ treatment technologies for the Old Carbon Tetrachloride Wastewater Treatment Pond and other SWMUs. The specific technologies and SWMUs needing treatment will be determined during remedial design. No significant changes have occurred in the remedy described in the Proposed Plan.

8.0 DESCRIPTION OF ALTERNATIVES

Four alternatives were considered for remediation of ground water, which contains unacceptable concentrations of carbon tetrachloride, carbon disulfide, thiocyanates, and thiocarbamates. The maximum and mean concentrations detected at different locations on the Stauffer LeMoyne site is listed in Table 6.1. The extent of the contaminant plume will be defined during the Remedial Design stage. The following remedial alternatives were considered:

8.1 Alternative 1 - No Action

- Shut down existing intercept and treatment system
- Shut down CNA Wells
- No treatment of sources

The first alternative is no-action, as required by Section 117(B) of the National Contingency Plan (NCP). This would entail shutting down the existing intercept and treatment system, as well as the wells at the Courtaulds North America property to the south, resulting in reverting the ground water flow direction toward the Mobile River. This would allow for potential migration of the contaminants in the aquifer toward water supply wells and the Mobile River, increasing the likelihood of exposure to workers on site via ingestion of ground water and enhancing the risk to aquatic life. The levels of contamination would gradually be reduced via natural processes, but at a very slow rate.

8.2 Alternative 2 - Existing Ground Water Intercept and Treatment System with Surface Water Discharge

- Continued use of existing intercept and treatment system
- Surface water discharge to Mobile River
- Monitoring of effluent, ground water concentrations and pumping rates

Alternative 2 involves the ground water intercept and treatment system which is currently in operation at the Stauffer LeMoyne site. Ground water is pumped from three extraction wells (Figure 8.1), located south of the Old Carbon Tetrachloride Plant Wastewater Treatment Pond, and into the treatment system. Treatment consists of aeration via spray-nozzles which discharge the ground water to the treatment pond and then to the Mobile River. The surface water discharge is regulated by the National Pollutants Discharge Elimination System (NPDES) permit as required under the Clean Water Act, for which standards are currently being met. However, it is unclear whether the extraction system is reducing contaminant concentrations in the ground water to the cleanup standards listed in Table 8.1. Applicable or relevant and appropriate requirements (ARARs) and "to-be-considered" health-based levels (TBCs) from which these cleanup levels were developed are also listed in this table. Periodic ground water monitoring would be included in this remedial action to determine if the ground water quality was improving at an acceptable rate.

A major assumption underlying this alternative includes the continued pumping of the CNA wells to the south. In the event these would be shut down, the remedy would be jeopardized due to changes in ground water flow direction which would reduce the ability of the existing extraction wells to capture the plume. Additional interceptor wells would be required to maintain gradient control and minimize off-site migration of contaminants.

8.3 Alternative 3 - Modified Ground Water Intercept and Treatment System with Surface Water Discharge

- Continued use of existing intercept and treatment system
- Installation of additional extraction wells
- Modifications to treatment system to be determined
- Monitoring of effluent, ground water concentrations and pumping rates

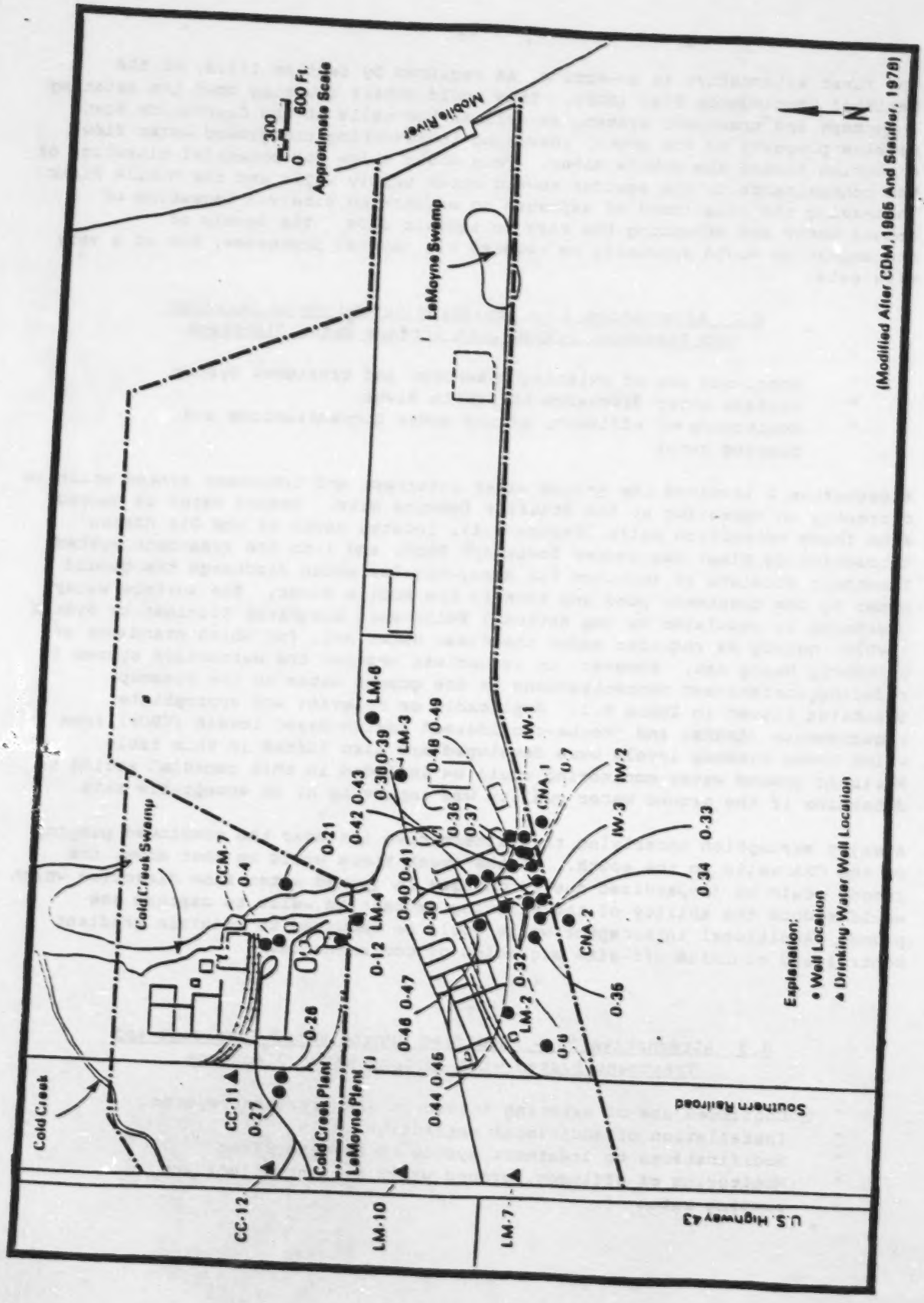


Figure 8.1 Site Area Well Locations

TABLE 8.1 - GROUND WATER CLEANUP GOALS

Chemical	Goal (ug/l)	Basis
Carbon Disulfide	700	LHA
Carbon Tetrachloride	5	MCL
Cyanide	200	LHA
Mercury	2	MCL
Thiocyanates	200*	LHA
Thiocarbamates**		
Butylate	350	LHA
Cycloate	7 ***	LHA
EPTC	210	LHA
Molinate	14	LHA
Pebulate	7 ***	LHA
Vernolate	7 **	LHA

MCL - Maximum Contaminant Level

LHA - Lifetime Health Advisory, based on RfD, 70 kg human 2 liter/day water consumption, 20% relative source contribution

* - No Agency health-based number exists for thiocyanates. The LHA for the more toxic cyanide is used.

** - These cleanup goals could be increased a maximum of fourfold pending an EPA Office of Drinking Water decision to revise the LHA values for these carbamate herbicides that allows a drinking water source contribution up to 80% of the RfD.

*** - No Agency-verified RfDs for these chemicals; the cleanup goal is based on the RfD for vernolate (the most toxic thiocarbamate at the site)

Alternative 3 involves a modification of the existing intercept and treatment system. Additional extraction wells would be installed, based on ground water quality characteristics, water-table gradients, and pumping activities at the site and adjacent properties. This alternative would allow for a more rapid achievement of the cleanup goals mentioned for Alternative 2. Surface water discharge must meet concentration limits specified in the NPDES permit. In addition, as for the previous alternative, a contingency plan would be necessary in case pumping of the CNA wells was terminated. Also, ground water monitoring would be conducted to determine the progress of the remediation.

8.4 Alternative 4 - Existing Ground Water Intercept and Treatment System with Surface Water Discharge and In-Situ Vapor Extraction

- Continued operation of existing intercept and treatment system
- Removal of accumulated rainwater, soil, and sludge from the Old Carbon Tetrachloride Plant Wastewater Treatment Pond
- In-Situ vapor extraction of soil beneath the Old CCl_4 Plant WWT Pond
- O&M of vapor extraction unit
- Monitoring of effluent and pumping rates

This alternative includes continued operation of the existing intercept and treatment system coupled with in-situ treatment by vapor extraction of the contaminated soil underlying the Old Carbon Tetrachloride Plant Wastewater Treatment Pond area. Bench-scale tests would be performed and sludge and accumulated rainwater would be removed from the pond prior to installation of the treatment system. Vapor extraction involves injection of clean air into soil containing volatile organic constituents. The constituents volatilize and the contaminated air would then be withdrawn via a vacuum and vented through an emission control system. Treatment of the pond area would expedite ground water remediation activities and attainment of cleanup standards by reducing leaching of contaminants into the ground water but would not effect ground water of contaminants from other sources. NPDES permit discharge limits will need to be met for all contaminants. As in Alternatives 2 and 3 a contingency plan would be required for possible shutdown of the CNA wells, and ground water monitoring would be conducted to evaluate progress of the remedy.

9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The major objective of the Feasibility Study (FS) was to develop, screen, and evaluate alternatives for remediating the Stauffer LeMoyne and Cold Creek sites. This decision document deals with the ground water, for which several remedial technologies were identified. These technologies were screened based on their feasibility given the contaminants present and site characteristics. Those which remained after the initial screening were evaluated in detail based on the nine criteria required by SARA, which are listed below:

1) Overall protection of human health and the environment;
2) Compliance with applicable or relevant and appropriate requirements (ARARs)
3) Long-term effectiveness
4) Reduction of toxicity, mobility or volume
5) Short-term effectiveness
6) Implementability
7) Cost
8) State acceptance
9) Community acceptance

Cost was used to compare alternatives only when they provided similar degrees of protection and treatment. Four alternatives remained after the detailed evaluation and were listed in the previous section. A summary of the relative performance of the alternatives with respect to each of the nine criteria is provided in this section.

9.1 Protectiveness of Human Health and the Environment

The no-action alternative is not protective of human health and the environment because it allows off-site migration of the contaminants, leading to possible ingestion of water from wells drilled into the surficial aquifer. Alternatives 2 and 4 would not be protective because contaminants have been detected off-site while the existing intercept and treatment system has been in operation. Alternative 4 may eliminate the source of carbon tetrachloride but will not deal with the thiocarbamates and other pollutants. Alternative 3 is potentially more protective than the other three, since additional extraction wells will be strategically placed to capture the contaminant plume.

9.2 Compliance with ARARs

Alternatives 1 and 2 do not comply with applicable or relevant and appropriate requirements (ARARs). Concentrations of hazardous substances in the ground water currently exceed EPA approved standards. Alternative 4 may help to meet the cleanup standards for carbon tetrachloride but not for the other contaminants. Addition of extraction wells in a modified ground water intercept system and source treatment, as described in Alternative 3, would comply with ARARs if properly designed.

The primary ARARs for the ground water are maximum concentration limits (MCLs) under the Safe Drinking Water Act (SDWA). These are applicable where water will be provided directly to 25 or more people or will be supplied to 15 or more service connections. MCLs are relevant and appropriate where the surface water or ground water is being used or may potentially be used for drinking water. The LaMoyne facility has two drinking water wells which provide water for 230 employees. Cold Creek has one drinking water well and a backup well serving 250 employees. Neighboring businesses also utilize well water for drinking purposes and there are approximately 21 residential water wells within a two-mile radius. Other ARARs that must be complied with are surface water discharge requirements of the National Pollutant Discharge Elimination System covered under the Clean Water Act (CWA). Air emissions specifications established by the Clean Air Act must also be met. EPA has determined that RCRA technical standards regarding corrective action and closure are relevant an appropriate for the SWMUs (ponds and landfills) at this site. RCRA Land Disposal Restrictions will be in effect once the contaminants have been

extracted from the ground water. These restrictions require treatment prior to redisposing the wastes.

The no-action alternative does not comply with the SDWA ARARs because it does not reduce ground water contaminant concentrations to MCLs. The existing ground water intercept system, Alternative 2, has not achieved these limits. Alternative 4 may meet these limits for carbon tetrachloride but not the other contaminants. All alternatives would comply with the NPDES permits for surface water discharge. Compliance with RCRA will be determined through monitoring of the Detection Monitoring wells. Alternative 3, if properly designed, would comply with all ARARs.

9.3 Reduction of Toxicity, Mobility, or Volume

All alternatives except for no action would reduce the toxicity and volume of the ground water contamination by decreasing the size of the plume and/or eliminating part of the source. Alternatives 2 and 4 may actually increase mobility of the contaminants by pulling them from the sources lying some distance from the extraction wells.

9.4 Short-term Effectiveness

The alternatives will require varying amounts of time to achieve cleanup of the site. None will be immediately effective upon completion of construction. Alternative 3 would require the shortest remediation time because it would remove the major sources of contamination and capture the ground water plumes more quickly. Any short-term risk to workers involved in construction of the remedy would be reduced through implementation of a health and safety plan.

9.5 Long-term Effectiveness

Long-term effectiveness and permanence would be provided only by Alternative 3, assuming future treatment of source units. Alternatives 2 and 4 would not provide long-term effectiveness because they would allow off-site migration to continue. The no-action alternative is not effective in the short or long term.

9.6 Implementability

The implementability of each alternative is based on technical feasibility, administrative feasibility and the availability of services and materials. All alternatives are technically and administratively feasible. All involve technologies which have been used in the past and have a demonstrated performance record. An intercept and treatment system is already in place and is meeting NPDES permit requirements. A modified system would simply require installation of additional extraction wells and is therefore easily attainable.

9.7 Cost

There would be no cost associated with Alternative 1. Since the ground water intercept and treatment system is already in place, a relatively low cost of $1,355,100 is estimated for Alternative 2. This cost includes repair of the treatment pond and Operations and Maintenance (O&M) costs. For Alternative 3, it was assumed that three additional extraction wells would be installed and that the only ground water constituents being treated are carbon tetrachloride and carbon disulfide. However, thiocyanates and thiocarbamates will also

require treatment. Therefore, the estimated total capital cost for well installation and O&M of the system of $3,119,200 may be low. Alternative 4 involves in-situ vapor extraction in addition to the existing treatment system. This would raise the estimated capital cost from that of Alternative 2 to $2,006,100.

9.8 State and Community Acceptance

The State of Alabama as represented by the Alabama Department of Environmental Management is in favor of a modified ground water intercept and treatment system for remediating the ground water at the Stauffer sites. Based on comments made by citizens at the public meeting held on July 27, 1989, and those received during the public comment period, the community believes a treatment system will effectively protect human health and the environment.

10.0 THE SELECTED REMEDY

Based on available data and analysis conducted to date, the US EPA selects Alternative 3 as the most appropriate solution for meeting the goals of the initial ground water operable unit at the Stauffer LeMoyne and Cold Creek sites. This alternative involves continued operation of the existing intercept and treatment system along with the installation of additional extraction wells. Ground water concentrations exceeding the cleanup goals listed in Table 8.1 must be reduced through treatment in order to achieve and an acceptable risk level. Operation and maintenance includes monitoring of contaminant levels in the ground water and the treatment system effluent as well as maintenance of the components of the system itself.

EPA has decided that bench and/or pilot scale testing of in-situ treatment alternatives for some SWMUs, including the Old Carbon Tetrachloride Plant Wastewater Treatment Pond, is appropriate as part of the Remedial Design. A range of treatment technologies including thermal desorption and vapor extraction is being considered, and a formal remedy for these response areas will be incorporated in a future Record of Decision.

As part of the modified ground water intercept and treatment system, Detection Monitoring wells will be designated and/or installed around the ponds and landfills for contaminant detection purposes. Upon detection of contaminants above cleanup standards, these wells will be redesignated as Point of Compliance (POC) wells. Data from the wells will be utilized to determine exact locations of the contaminant plumes and to design ground water extraction modifications, which will ensure that off-site ground water activities will not detrimentally effect remediation of the Stauffer sites. Ground water modeling will be employed to design and verify any extraction modifications. Information from the Detection Monitoring wells will also help determine which source units are in need of CERCLA remedial or RCRA corrective action.

Already in existence are RCRA and NPDES permits which regulate ongoing hazardous waste and surface water discharge activities, respectively. EPA and ADEM are the designated agencies for enforcing these permits.

The rationale for choosing this alternative includes the following reasons. The alternative:

- provides immediate protection to human health from the potential threats associated with consumption of ground water;

- reverses the continued migration and expansion of the contaminant plume and prevents off-site migration;
- provides for management of surface water quality through monitoring of contaminant levels in the surficial aquifer and possible surface water discharges;
- is consistent with additional site actions and will be compatible with the final site remedy;
- contributes to the implementation of a more permanent remedy at the site;
- allows for a more complete and expeditious remediation of the ground water than the other alternatives.

The goal at the completion of the entire remedial action is to meet the ground water cleanup standards listed in Table 8.1 at each of the designated Detection Monitoring wells as well as at the extraction wells. These wells will be monitored for 30 years. If a release is detected at a Detection Monitoring well, it will be redesignated as a Point of Compliance well and CERCLA remedial or RCRA corrective action will be instituted at the appropriate SWMU.

11.0 STATUTORY DETERMINATIONS

The US EPA and ADEM have determined that this remedy will satisfy the following statutory requirements of section 121 of CERCLA: protection of human health and the environment, attaining ARARs, cost-effectiveness, and utilization of permanent solutions and alternative treatment technologies to the maximum extent practicable.

11.1 Protection of Human Health and the Environment

The selected remedy adequately protects human health by reducing the risk of consumption of contaminated ground water. This will be accomplished through the prevention of off-site migration and the capture of the ground water contaminant plume. Environmental risk will be reduced by directing the plume away from the Mobile River. No unacceptable short-term risks will result from the implementation of this remedy.

11.2 Attainment of Applicable or Relevant and Appropriate Requirements

This remedy assures that drinking water supplied to current well users will meet available MCLs under the Safe Drinking Water Act (SDWA). For those chemicals which do not have assigned MCLs, to-be-considered health-based values will be attained. Discharge from the ground water treatment system will meet NPDES permit discharge limits under the Clean Water Act (CWA). Compliance with RCRA technical standards will be achieved through corrective action on any SWMUs that are determined to be releasing contaminants to the ground water. The CWA is an applicable requirement, while the SDWA (MCLs) and RCRA are relevant and appropriate.

11.3 Cost-Effectiveness

The selected alternative, although more costly than the others, provides a higher degree of protectiveness. The modified ground water intercept and treatment system will protect well users from ingestion of contaminated ground water by capturing the plume and reducing the contaminant concentrations to health-based levels. It will also provide a more rapid attainment of these levels and assist in the remedial action for the other operable units. The total capital cost of this alternative is $3,119,200. The US EPA has determined that the costs of the selected remedy are proportionate to the overall effectiveness and is a reasonable value for the money.

11.4 Utilization of Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

The US EPA has determined that the selected remedy provides the best balance among the nine evaluation criteria for the four alternatives evaluated. The selected remedy was the only alternative to provide definite protection of human health and the environment, to reduce the mobility of the plume and to be effective in the long term. The remedy contributes to and is consistent with future remedial actions at this site. It represents the maximum extent to which permanent solutions and treatment can be practicably utilized for this operable unit.

11.5 Preference for Treatment as a Principal Element

The statutory preference for treatment will be met because the principal threat from the Stauffer sites is ingestion of contaminated ground water. In additon, contaminated soils or sludges at the SWMUs are sources of ground water contamination. The selected remedy will reduce this risk through capture of the ground water plume and treatability testing of the contaminant sources.

RESPONSIVENESS SUMMARY
FOR THE
PROPOSED REMEDIAL ACTION PLAN
AT THE
STAUFFER CHEMICAL LEMOYNE
AND COLD CREEK SITES
MOBILE, ALABAMA

Public Comment:
July 13 through August 12, 1989

September 1989

Prepared for:
U.S. Environmental Protection Agency
Region IV

Prepared by:
Booz•Allen & Hamilton Inc.
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with CDM Federal Programs Corporation

STAUFFER CHEMICAL LEMOYNE AND COLD CREEK SITES

RESPONSIVENESS SUMMARY FOR THE PROPOSED REMEDIAL ACTION PLAN

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Responsiveness Summary
Stauffer Chemical Lemoyne and Cold Creek Sites

This community relations responsiveness summary is divided into the following sections:

Section I — Overview. This section discusses EPA's preferred alternative for remedial action and public reaction to this alternative.

Section II — Background on Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during remedial planning at the Stauffer Chemical sites.

Section III — Summary of Major Comments Received During the Public Comment Period and the EPA Responses to the Comments. Both written and oral comments are categorized by relevant topics. EPA responses to these major comments are also provided.

Section IV — Summary of Major Comments Received Following the Closing of the Public Comment Period and EPA Responses to the Comments. This section presents the late comments received from Courtaulds Fibers, Inc. and EPA's responses.

Section V — Remaining Concerns. This section describes remaining community concerns that EPA and the State of Alabama should be aware of in conducting the remedial design and remedial action at the Stauffer Chemical sites.

I. OVERVIEW

At the time of the public comment period, EPA published its preferred alternative for the Stauffer Chemical sites in Mobile County, Alabama. EPA's recommended alternative addressed the ground-water contamination at the site. The preferred alternative involves a modified intercept and treatment system with surface water discharge. This alternative involves continued operation of the existing intercept and treatment system as well as the installation of additional ground-water extraction wells.

II. BACKGROUND ON CITIZEN INVOLVEMENT AND CONCERNS

Community interest and concern regarding the site has been extremely limited to date. It is believed that community involvement at the Stauffer sites has been low because the sites

are in a rural area with neighboring industrial plants and a few residents constituting the entire local community.

To get public input on the proposed remedy, EPA held a public comment period from July 13 to August 12, 1989. EPA's community relations efforts included a fact sheet that was sent to the information repository in July 1989, a public meeting notice that appeared in The Mobile Press Register on July 13 and July 26, 1989, and a public meeting that was held July 27, 1989. Approximately 14 persons attended the meeting. Site information repositories contain the RI/FS Report and other relevant documents. EPA also maintained contact with local officials and citizens throughout the remedy selection process.

III. SUMMARY OF MAJOR COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND THE EPA RESPONSES TO THE COMMENTS

Concerns and questions on the proposed remedy for the Stauffer Chemical sites received at the public meeting July 27, 1989 and during the public comment period can be grouped into four categories:

A. Implementation of Remedy

B. Health Concerns

C. Off-site Contamination

D. Miscellaneous

A summary of the comments and EPA's responses to them is provided below.

A. Implementation of Remedy

- A citizen asked if the toxins removed from the site will be sent to another site.

  EPA Response. The plan for this site is on-site cleanup. The existing treatment system will be modified and additional ground-water monitoring will take place to determine the type of cleanup that can take place on the site.

- An attendee asked about the evaporative treatment pond method. If this method is used, the citizen assumes that what is left would be a sludge. Would that have to go into a landfill?

  EPA Response. EPA plans to perform on-site treatment at this facility which means that sludge would not be sent to a landfill. At present, EPA is considering alternatives presented for ground-water cleanup only. As Point of

Compliance wells, which detect the release of contaminants to the ground water, are installed throughout the site, additional information will be available to determine which source units need to be treated. EPA will require treatability studies for the particular waste on site to determine the best treatment available for that type of waste.

The extracted ground water will be treated by aeration, which does not generate a sludge for the volatiles, and then processed by the existing treatment facilities at the plant before being discharged into the Mobile River.

- A citizen wanted to know the likelihood that salt water intrusion into the Mobile River, and subsequently, the aquifer, might occur.

  EPA Response. EPA feels that the transient movement of salt water wedges up in the channel of the Mobile River will not cause a permanent change in the salinity of that aquifer.

- An attendee asked if the proposed alternative was preferred because the other alternatives would not remove pollutants and chemicals that are detected off-site or in other places.

  EPA Response. Yes. The existing system is allowing the off-site migration of the contaminants. The proposed plan is to put in more wells to capture the contaminants and keep them from going off-site.

- An attendee asked how many proposed extraction wells would be put in the contaminated areas.

  EPA Response. The number of wells will be determined during the remedial design phase.

- The Manager of Environmental Affairs for Akzo stated that the Old Brine Mud Pond, which was included in the proposed RD/RA plan, is not an operable unit subject to this investigation and should not be included in this investigation. The pond is delisted under Resource Conservation and Recovery Act (RCRA) regulations and is closed in accordance with a delisting petition approved by EPA and the Alabama Department of Environmental Management (ADEM). This pond should have been deleted from the list of RCRA facilities in the RI/FS.

  EPA Response. The Old Brine Mud Pond has been delisted under RCRA regulations; however, this does not preclude it from being monitored as a Solid Waste Management Unit (SWMU). Any decisions concerning this SWMU will be made in a future Record of Decision.

- Akzo's representative stated that in the Proposed Plan, EPA refers to monitoring wells to be designated and/or installed around the ponds and landfills for detection purposes as Point of Compliance (POC) wells. EPA's reference to monitoring wells as POC wells is incorrect. There has been no determination that corrective action under RCRA is necessary at the sites. Use of RCRA terminology is, therefore, inappropriate.

  EPA Response. EPA has determined that RCRA regulations are relevant and appropriate at the Stauffer Chemical sites, and therefore "Detection Monitoring" wells must be designated or installed around the Solid Waste Management Units (ponds and landfills) in order to detect any releases of hazardous substances to the ground water. Upon detection of contaminants above cleanup standards, these wells will be redesignated as "Point of Compliance" wells.

- Akzo and ICI believe that it would be more effective to conduct ground-water monitoring instead of ground-water modeling, which EPA proposed. The result of such modeling and monitoring should be the basis for evaluation and selection of ground-water treatment alternatives and/or any requirement for modification of the existing intercept system.

  EPA Response. EPA's proposal of a modified intercept and treatment system is based upon existing data. Ground-water monitoring and modeling will be used to specify design criteria, i.e., the number and location of additional extraction wells. Monitoring of POC wells will be used to determine which source units will require treatment. However, treatability testing in parallel with monitoring is appropriate in areas where wastes are homogeneous and concentrated. Furthermore, EPA guidance recommends treatability in order to evaluate a range of alternatives. EPA does not propose to test every treatment alternative at the source units, but only those appropriate for the waste to be treated.

- The Manager of Environmental Affairs for Akzo noted that while ground-water alternatives 1, 2, and 4 are technically and administratively feasible, the technical and administrative feasibility of alternative 3 must be determined by modeling to ensure that ground-water availability to Courtaulds will not be significantly reduced.

  EPA Response. Ground-water modeling is not required to show the administrative feasibility of Alternative 3. The technical feasibility of a design plan is tested during the remedial design and prior to implementation. EPA will take into account Courtaulds' ground-water needs at this time.

- The Akzo representative stated that EPA indicates that alternative 3 would require the shortest remediation time and achieve long-term effectiveness and performance. Akzo believes the ground-water modeling and point source monitoring will aid in the determination of length of time required for remediation of ground water under various alternatives.

EPA Response. Ground-water modeling and monitoring will aid in the determination of the length of time required for remediation of ground water under the selected remedy that is set forth in the ROD.

B. Health Concerns

- An attendee asked about specific health risks involved with the site and who might be affected.

EPA Response. At this point, EPA is discussing the ground-water unit only. The highest levels of contamination are on site. EPA and the Agency for Toxic Substances and Disease Registry (ATSDR), an agency of the U.S. Public Health Service, look at the potential for people to be exposed if the contamination is left unattended. The contamination may migrate over time and may put people at risk for drinking it, swimming in it, and so on. There is no specific number of people that are known to be at risk at this time.

- The Manager of Environmental Affairs for Akzo stated that the applicable or relevant and appropriate requirements proposed by EPA for thiocarbamates other than butylate (these are EPTC, Molinate, vernolate) do not appear to be based on published health advisories and are, therefore, inappropriate as cleanup standards.

EPA Response. EPA's health-based cleanup standards for thiocarbamates are calculated from reference doses listed in EPA's Integrated Risk Information System (IRIS), which is available for public review. Information concerning IRIS may be obtained by contacting the EPA Region IV library at (404) 347-4216.

C. Off-Site Contamination

- A citizen asked how much contamination has occurred to the Mobile River delta or to the Mobile River itself.

EPA Response. From EPA's collection of data, EPA feels that more data is needed, particularly for the river. Since 1980, the ground-water movement toward the river has been captured by the existing intercept and treatment system.

D. Miscellaneous

- A citizen asked if there were any pending permit applications for more holding ponds or if any permit applications had recently been approved to make more holding ponds.

  EPA Response. The RCRA permit has not changed. There is only one permitted pond on site.

- An attendee asked if a copy of the Administrative Record could be placed in a library closer to the site area.

  EPA Response. There should be no problem getting a copy for the library in Chickasaw.

- A few citizens were concerned about the public comment period. They felt it was only 12 days long instead of 30, and thought that it should be extended.

  EPA Response. There were two public notices placed in The Mobile Press Register, one on July 13 and one on July 26, 1989. Also, a press release appeared on July 27, 1989. The public comment period began when notice first appeared in the paper on July 13 and will run for 30 days.

- One attendee asked who pays for the cleanup.

  EPA Response. The fees are negotiated between EPA and the responsible parties. If the responsible parties want to perform the remedy EPA selects, then they are responsible for financing it. The Agency also gets reimbursed for its cost for oversight and reviewing and approving plans.

- An attendee asked if EPA ever sets a numeric ground-water standard when a state does not.

  EPA Response. EPA does set ground-water protection standards that will be protective of human health should that ground water ever be used as a drinking water source.

- A citizen asked if EPA has an overall management plan when there are several Superfund sites in an area.

  EPA Response. From a water management standpoint, typically that is a state activity. The Agency is organized into divisions that deal with all the hazardous waste problems in this particular part of Alabama and this area of the country. EPA does not typically manage resources. It only manages the environment protection aspect, the contamination, and cleanup. In many instances, where Superfund sites with ground-water plumes are close to one another, the overall remedy is managed as one.

- The Akzo representative stated that the LeMoyne plant's landfill is located near the eastern property line.

  EPA Response. EPA stated that the LeMoyne landfill is at the eastern end of the site. The above is simply a different way of stating this.

- The Manager of Environmental Affairs for Akzo stated that EPA has introduced, in the Proposed Plan, a requirement for treatment of thiocarbamates in the ground water at the sites that is not addressed in the RI/FS and that has not been subjected to National Contingency Plan (NCP) requirements. It is likely that the present low levels of thiocarbamates will be further reduced by source control proposed in the FS. It would be a misuse of resources that are better directed elsewhere to install or expand a thiocarbamate ground-water extraction/treatment system in view of the fact that the thiocarbamate levels are very low and will be further reduced when the proposed source control is implemented.

  EPA Response. The draft FS incorrectly infers that thiocarbamates will not require treatment. The EPA Addendum to the FS placed in the repository prior to the start of the public comment period points out this deficiency explicitly. Thiocarbamates are subject to CERCLA requirements. The EPA requirement to treat thiocarbamates is not "newly imposed." EPA has repeatedly stated in comment letters on the FS that thiocarbamates are covered under CERCLA and have been found in the ground water at the Stauffer sites in concentrations above cleanup standards. These comment letters are part of the public record and have been placed in the site repository. Possible location of an additional extraction well or wells at the Cold Creek site was mentioned as an example. As previously stated, ground-water modeling and monitoring will help to determine the number and location of additional extraction wells. Once again, levels of thiocarbamates being discharged to the Mobile River under the NPDES permit are a separate issue. The issue of concern here is contaminant levels in the ground water. In response to the statement that thiocarbamate levels are "very low," the RI indicates thiocarbamate concentrations in certain wells exceed health-based cleanup goals. Therefore, these contaminants must be removed from the ground water at or near their source in order to prevent spreading of the contaminant plume.

IV. SUMMARY OF COMMENTS RECEIVED FOLLOWING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES

On August 6, 1989, EPA received a letter from the law office representing Courtaulds Fibers Inc., requesting an extension of the public comment period. The letter explained that the Proposed

Plan was not received by Courtaulds until July 27, the same day as the public meeting for the site. Due to the late receipt of the plan, Courtaulds was not able to comment on the plan at the meeting. To ensure an opportunity for both Courtaulds and its legal representative to review and comment on the plan, Courtaulds requested that the closing date of the public comment period be extended from August 12 to August 28, 1989.

EPA did not agree to extend the public comment period beyond 30 days. EPA did agree, however, to accept and respond to comments received from Courtaulds after the close of the formal comment period, but on or before August 28, 1989.

The comments received and EPA responses to them follow a summary of Courtaulds' position.

Summary of Courtaulds' Comments

Courtaulds believes that Alternative 3 is not supported by the RI/FS, and that the Proposed Plan does not provide an independent basis for EPA's selection. EPA's assertion that Alternative 3 satisfies more of the selection criteria than does Alternative 2 is unfounded. In view of Courtaulds' disfavor with Alternative 3, by definition only Alternative 2 satisfies the selection criteria. Based on the reasons cited below, Courtaulds urges EPA to reconsider its selection of Alternative 3.

Specific Comments

- Off-Site Contamination. EPA states that Alternative 2 would not be protective of human health and the environment because contaminants have been detected off site. While it is true that contaminants have been detected off site, several facts undermine the significance of this statement.

  First, implicit in EPA's selection of Alternative 3 is the assumption that the existing intercept system is inadequate because off-site migration of contamination has occurred during the time the system has been in operation. It is not clear whether the contamination migrated beyond the site since the existing system became operational, or whether such contamination pre-existed the system's implementation.

  Second, if the migration occurred more recently, Alternative 2 could only be considered "less protective" of the environment if the contamination that migrated off-site threatened to contaminate drinking water supplies. This is not the case. Drinking water supplies are not and, according to the RI/FS, likely will not be affected by off-site contamination.

  Third, the Feasibility Study states that the levels of ground-water contamination have been substantially reduced

since 198[illegible] and that treated effluent concentrations from the system have continuously met discharge limits set by the Alabama Department of Environmental Management. This suggests that existing remediation activities at the site are functioning successfully and as intended, and there is no factual basis to support a decision to change.

Fourth, EPA has acknowledged that the existing system, in conjunction with Courtaulds' pumping activities, has produced a capture zone that extends from the Southern Railway tracks, located near the western Cold Creek/LeMoyne site boundary, east to the Mobile River. The breadth of this capture zone makes it unlikely any contamination will migrate from it.

Based on the above, the RI/FS confirms that the only off-site contamination is located on the Courtaulds property, that drinking water supplies are not affected by it, and that the concentration of those contaminants has decreased considerably and continue to decrease as a direct result of the existing ground-water treatment system in combination with Courtaulds' pumping activities. Thus, Courtaulds does not believe the detection of off-site contamination supports the selection of Alternative 3.

EPA Response. The existence of off-site migration is not based solely upon the detection of contaminants in Courtaulds' wells. It is also based on ground-water modeling, which indicates that ground water in the southeastern portion of the Stauffer sites is not being captured by the existing extraction system. Although existing data show no impact on drinking wells as yet, the potential for contaminated drinking water exists. The fact that carbon tetrachloride levels in the surface water discharge limits have been met does not mean that the ground water beneath the entire site is being effectively remediated. As previously mentioned, EPA has determined from modeling data that the ground water at the Stauffer sites is not entirely captured by the existing extraction wells. Furthermore, the effectiveness of the PRPs' proposed remedy relies on continued pumping of the Courtaulds wells. EPA is proposing a remedy that will not depend on external entities (i.e., the Courtaulds wells) to make the remedy complete.

ARARs. According to EPA, Alternative 2 would not attain applicable or relevant and appropriate requirements because concentrations of hazardous substances in the ground water currently exceed drinking water criteria and other standards based on protection of human health. The RI/FS states, however, that the area drinking water supply has not been affected. Based on that statement, maximum contaminant levels (MCLs) may not be applicable. Furthermore, the RI/FS states that although an impact on ground water is evident in the vicinity of the carbon disulfide pond, the pond is no

longer affecting the ground water due to the construction of an impermeable cap that now covers the pond.

If the configuration of the aquifer were such that drinking water supplies were affected, the inability to achieve an ARAR will not necessarily prevent selection of a remedy. As EPA is aware, if a remedy is protective, cost-effective, and otherwise adequately satisfies the statutory criteria, EPA is authorized to select it. CERCLA expressly provides for waivers for certain remedies that do not attain ARARs. Although it is not necessary to seek such a waiver in these circumstances, the fact that these statutory and policy mechanisms are available suggest that the failure to attain an ARAR alone is not sufficient basis for rejecting a remedy.

EPA Response. The use of MCLs as ARARs is relevant and appropriate where the surface water or ground water is being used or potentially may be used for drinking water. There are drinking water wells already located on both the LeMoyne and Cold Creek sites. The statement in the RI/FS that future exposure to contaminated ground water is highly unlikely is speculative. The inability to achieve ARARs is sufficient grounds for rejecting a remedy when one that does attain them is available.

The "Interim Guidance on Superfund Selection of Remedy" (December 1986) states that "remedial action for a site should be selected among those alternatives about which the following (holds true): ... the remedy meets or exceeds ARARs or health-based levels established through a risk assessment when ARARs do not exist." The fact that the opportunity exists to seek an ARAR waiver does not suggest that attainment of ARARs is not an essential criteria in remedy selection.

- Cost-Effectiveness. The construction and maintenance of the ground-water treatment system described in Alternative 3 would cost, at a minimum, over $3.1 million. This is significantly more than the cost of the existing system, with no demonstrated benefit. EPA's unsupported claim that Alternative 3 is cost-effective is thus incorrect.

EPA Response: Alternative 3 provides a higher degree of protectiveness than Alternative 2. A modified intercept and treatment system will prevent off-site migration and stop the spreading of contaminants from sources which are distant to the existing wells. Additional extraction wells could significantly reduce the time required for remediation and as a result, the total cost of Alternative 3 relative to Alternative 2.

- Off-Site Uses of Ground Water. The water used in Courtaulds' cooling and manufacturing processes is ground water. Surface

water cannot be used. Alternative 3 could have a profound impact on Courtaulds' ability to extract sufficient quantities of ground water for use in its manufacturing operations. Although the Proposed Plan does not state the number and/or location of extraction and monitoring wells that would be installed at the site under this alternative, Courtaulds understands that EPA is considering the installation of at least three and possibly up to twenty or more extraction wells at the site. Assuming conservatively that each extraction well has a pumping rate of 500 gallons per minute, the installation and the use of up to twenty wells would undoubtedly restrict the availability of ground water for use in Courtaulds' process. If even half of these extraction wells were installed and operating, there is significant doubt whether Courtaulds would be able to continue its manufacturing operations, or expand current manufacturing activities at the current plant location.

EPA Response. EPA does not "select" a remedy until the Record of Decision (ROD) is signed. Furthermore, EPA does not intend to adversely affect the availability of ground water to Courtaulds Fibers. This issue will be considered during the remedial design phase. It is anticipated that only a few additional extraction wells will be required and may or may not be located close to the Courtaulds property. The number and location of wells is to be determined through ground-water monitoring and modeling, which will be conducted during the remedial design phase. Availability of ground water to the Courtaulds plant will be taken into account at that time.

V. REMAINING CONCERNS

Local residents expressed several remaining concerns in regard to remedial operations at the Stauffer sites. They remain concerned about ground-water treatment, off-site contamination, and health effects. EPA will continue to coordinate with the other agencies involved to get site information to the citizens.

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STAUFFER CHEMICAL CO. AXIS PLANT

NPL Site Administrative Record

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U.S. Environmental Protection Agency

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STAUFFER CHEMICAL CO. AXIS PLANT
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Administrative Record Index

INTRODUCTION

This document is the Index to the Administrative Record for the Stauffer Chemical Co. Axis Plant National Priorities List (NPL) site.

The Administrative Record is available for public review at EPA Region IV's Office in Atlanta, Georgia, and at the Toulminville Branch Library, 2318 State Stephens Road, Toulminville, Alabama 36617.

Questions concerning the Administrative Record should be addressed to the EPA Region IV site manager.

The Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Section I
Site-Specific Documents

ADMINISTRATIVE RECORD INDEX

for the

STAUFFER CHEMICAL CO. AXIS PLANT NPL Site

1.0 PRE-REMEDIAL

1.2 Preliminary Assessment

1. "Potential Hazardous Waste Site - Identification and Preliminary Assessment," Javier Colon, EPA Region IV (December 13, 1979). Concerning the Stauffer Chemical Co. sites.

1.3 Site Inspection

1. "Hazardous Waste Site Investigation - Groundwater Monitoring - Stauffer Chemical Corporation - Axis and Bucks, Alabama," James Kopotic, EPA Region IV (May 18, 1983). Concerning the investigation conducted October 12, 1982, through October 16, 1982.
2. "Potential Hazardous Waste Site - Site Inspection Report," Jennifer Scott-Simpson, EPA Region IV (July 13, 1983). Concerning the Stauffer Chemical Co. Axis Plant site.

3.0 REMEDIAL INVESTIGATION (RI)

3.1 Correspondence

1. Cross-Reference: Letter from J.D. Sheehan, Stauffer Chemical Company, to James Orban, EPA Region IV (December 21, 1984). Concerning participation by Stauffer Chemical Company in a remedial investigation and feasibility study at Stauffer's Cold Creek plant. [Filed and cited as entry number 1 in 11.10 POTENTIALLY RESPONSIBLE PARTIES (PRP) - PRP-Specific Correspondence]
2. Letter from Harold Taylor, EPA Region IV, to T.J. Sayers, Stauffer Chemical Company (March 21, 1988). Concerning modifications to the analytical and reporting procedures for the Remedial Investigation/ Feasibility Study at the Stauffer Chemical Co. sites.
3. Letter from Patrick Tobin, EPA Region IV, to Steve Perry, Akzo Chemicals Inc. (August 23, 1988). Concerning issuance of the attached "Notice of RCRA Final Permit Decision".

3.2 Sampling and Analysis Data

The Sampling and Analysis Data for the Remedial Investigation (RI) may be reviewed, by appointment only, at EPA Region IV, Atlanta, Georgia

1. "Remedial Investigation/Feasibility Study - Cold Creek/ LeMoyne Site - Sampling & Analysis Manual," Stauffer Chemical Company (August 9, 1985). Note: The appendices to this manual have not been copied for the administrative record. They are contained within items 7, 8, 9, 11, and 31 in the Guidance Documents section of this index.
2. Letter from Horst Caspers, Stauffer Chemical Company, to Jim Orban, EPA Region IV (November 18, 1985). Transmitting the attached pages updating the August 9, 1985, "Remedial Investigation/Feasibility Study - Cold Creek/LeMoyne Site - Sampling & Analysis Manual," Stauffer Chemical Company.
3. Letter from Horst Caspers, Stauffer Chemical Company, to Wade Knight, EPA Region IV (April 25, 1986). Transmitting the attached revisions to analytical methods in the August 9, 1985, "Remedial Investigation/ Feasibility Study - Cold Creek/LeMoyne Site - Sampling & Analysis Manual," Stauffer Chemical Company.

3.4 Interim Deliverables

1. "Sensitive Receptor Report - Cold Creek/LeMoyne Remedial Investigation Study," Stauffer Chemical Company [?] (September 5, 1986).

3.6 Remedial Investigation (RI) Reports

1. Letter from Thomas Sayers, Stauffer Chemical Company, to Thu Kim Dao, EPA Region IV (February 20, 1987). Concerning transmittal of the draft "Remedial Investigation Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".
2. Memorandum from Cody Jackson, Agency for Toxic Substances and Disease Registry, to Thu Kim Dao, EPA Region IV (April 1, 1987). Concerning comments on the draft "Remedial Investigation Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".
3. Letter from Thu Kim Dao, EPA Region IV, to Thomas Sayers, Stauffer Chemical Company (May 19, 1987). Concerning comments on the draft "Remedial Investigation Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".

3.6 Remedial Investigation (RI) Reports (cont'd.)

4. Letter from Sylvie Olney and Wanda Ratliff, ERT for Akzo Chemicals Inc. and ICI Americas Inc., to Ellen VanDuzee, EPA Region IV (January 27, 1988). Concerning transmittal of the draft "Remedial Investigation Report for the Cold Creek/LeMoyne Site" (revision 2) and draft "Endangerment Assessment Report - Cold Creek/LeMoyne Site".
5. Letter from Wanda Ratliff, ERT for Akzo Chemicals Inc. and ICI Americas Inc., to Ellen VanDuzee, EPA Region IV (February 9, 1988). Transmitting the attached corrected version of Appendix XXVI of the "Remedial Investigation Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".
6. Memorandum from Ellen VanDuzee, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (February 17, 1988). Concerning comments on the draft "Remedial Investigation Report for the Cold Creek/LeMoyne Site" (revision 2) and draft "Endangerment Assessment Report - Cold Creek/LeMoyne Site".
7. "Remedial Investigation Report for the Cold Creek/ LeMoyne Site, Mobile County, Alabama - Final Report," Akzo Chemicals Inc., and ICI Americas (May 1988).
8. Letter from Charles Margin and Sylvie Olney, ERT for Akzo Chemicals Inc. and ICI Americas Inc., to Larry Meyer, EPA Region IV (May 16, 1988). Responding to the February 17, 1988, comments from Ellen VanDuzee, EPA Region IV.
9. Letter from Kurt Batsel, Camp Dresser & McKee Inc., to Larry Meyer, EPA Region IV (July 15, 1988). Concerning comments on the May 16, 1988, ERT response to EPA Region IV comments.
10. Letter from Lee Erickson, ICI Americas Inc., to Benjamin Moore, EPA Region IV (September 22, 1988). Responding to EPA Region IV comments on the draft "Remedial Investigation Report for the Cold Creek/ LeMoyne Site, Mobile County, Alabama" (revision 2).

3.7 Work Plans and Progress Reports

1. "Final Work Plan for Stauffer Chemical Cold Creek and LeMoyne Sites - Remedial Investigation/Feasibility Study - Mobile County, Alabama - Volume I," Camp Dresser & McKee Inc. (August 27, 1985).
2. "Final Work Plan for Stauffer Chemical Cold Creek and LeMoyne Sites - Remedial Investigation/Feasibility Study - Mobile County, Alabama - Volume II," Camp Dresser & McKee Inc. (August 27, 1985).
3. "Amendment to Work Plan for Stauffer Chemical Company Sites - Mobile County, Alabama - Volume II," Camp Dresser & McKee Inc. (August 1, 1988).

3.9 Health Assessments

1. "Health Assessment for Stauffer Chemical Company National Priorities List (NPL) Sites, Mobile, Alabama," Agency for Toxic Substances and Disease Registry (January 6, 1989).
2. Letter from Diane Scott, EPA Region IV, to Dan Cooper, State of Alabama Department of Environmental Management (February 14, 1989). Concerning transmittal of the Health Assessments for the Stauffer Chemical Co. sites.
3. Letter from Diane Scott, EPA Region IV, to James Hathcock, State of Alabama Department of Environmental Management (February 14, 1989). Concerning transmittal of the Health Assessments for the Stauffer Chemical Co. sites.

3.10 Endangerment Assessments

1. "Endangerment Assessment Report - Cold Creek/LeMoyne Site, Mobile County, Alabama - Draft," ERT for Akzo Chemicals Inc. and ICI Americas Inc. (January 1988).
2. Letter from E.R. Roach, U.S. Fish and Wildlife Service, to Ellen VanDuzee, EPA Region IV (February 12, 1988). Concerning comments on the January 1988 "Endangerment Assessment Report - Cold Creek/LeMoyne Site, Mobile County, Alabama - Draft," ERT for Akzo Chemicals Inc. and ICI Americas Inc.
3. "Endangerment Assessment Report - Cold Creek/LeMoyne Site, Mobile County, Alabama," ERT for Akzo Chemicals Inc. and ICI Americas Inc. (May 1988).

4.0 FEASIBILITY STUDY (FS)

4.1 Correspondence

1. Letter from Benjamin Moore, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (September 7, 1988). Concerning the decision to conduct a biological study of the Cold Creek Swamp and other matters.

4.4 Interim Deliverables

1. "Stauffer Chemical Company - Cold Creek and LeMoyne Sites, Mobile, Alabama - Contaminant Transport Modeling - Final Report," Camp Dresser & McKee Inc. (June 30, 1988).

4.5 Applicable or Relevant and Appropriate Requirements (ARARs)

1. Letter from Diane Scott, EPA Region IV, to Charle. Horn, State of Alabama Department of Environmental Management (May 30, 1989). Concerning Alabama water quality criteria as applicable to the Stauffer Chemical Co. sites.

4.6 Feasibility Study (FS) Reports

1. Letter from Benjamin Moore, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (September 7, 1988). Concerning comments on the draft "Feasibility Study Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".
2. Cross-Reference: Letter from Lee Erickson, ICI Americas Inc., to Benjamin Moore, EPA Region IV (September 22, 1988). Responding to EPA Region IV comments on the draft "Remedial Investigation Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama" (revision 2). [Filed and cited as entry number 10 in 3.6 REMEDIAL INVESTIGATION (RI) - Remedial Investigation (RI) Reports]
3. Letter from Mariam Tehrani, Akzo Chemicals Inc., to Benjamin Moore, EPA Region IV (September 28, 1988). Responding to the Mr. Moore's comments of September 7, 1988.
4. Letter from Benjamin Moore, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (November 16, 1988). Concerning additional comments on the draft "Feasibility Study Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".
5. Letter from Benjamin Moore, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (January 24, 1989). Concerning comments on the draft "Feasibility Study Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".
6. Meeting Agenda, EPA Region IV and Akzo Chemicals Inc. (March 16, 1989). Concerning discussion of comments on the draft "Feasibility Study Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".
7. Letter from Patrick Tobin, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (March 24, 1989). Transmitting a summary of the March 16, 1989, meeting between representatives of EPA Region IV and Akzo Chemicals Inc.
8. Letter from Mariam Tehrani, Akzo Chemicals Inc., to Patrick Tobin, EPA Region IV (April 6, 1989). Responding to EPA Region IV comments on the draft "Feasibility Study Report for the Cold Creek/LeMoyne Site, Mobile County, Alabama".

4.6 Feasibility Study (FS) Reports (cont'd.)

9. Letter from Lee Erickson, ICI Americas Inc., to Patrick Tobin, EPA Region IV, with Attachments (April 13, 1989). Responding to EPA Region IV comments on the draft "Feasibility Study Report for the Cold Creek/ LeMoyne Site, Mobile County, Alabama".
10. Letter from Diane Scott, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (April 21, 1989). Responding to Ms. Tehrani's letter of April 6, 1989, to Patrick Tobin.
11. Letter from Diane Scott, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (May 11, 1989). Concerning Point of Compliance wells at the Stauffer Chemical Co. sites.
12. "Feasibility Study for the Cold Creek and LeMoyne Sites, Mobile County, Alabama," ENSR Consulting and Engineering for Akzo Chemicals Inc. and ICI Americas Inc. (June 1989).
13. Letter from Diane Scott, EPA Region IV, to James Hathcock, State of Alabama Department of Environmental Management (June 22, 1989). Transmitting the draft Proposed Plan and the "Feasibility Study for the Cold Creek and LeMoyne Sites, Mobile County, Alabama," ENSR Consulting and Engineering for Akzo Chemicals Inc. and ICI Americas Inc.

4.7 Work Plans and Progress Reports

1. Cross-Reference: "Final Work Plan for Stauffer Chemical Cold Creek and LeMoyne Sites - Remedial Investigation/Feasibility Study - Mobile County, Alabama - Volume I," Camp Dresser & McKee Inc. (August 27, 1985). [Filed and cited as entry number 1 in 3.7 REMEDIAL INVESTIGATION (RI) - Work Plans and Progress Reports]
2. Cross-Reference: "Final Work Plan for Stauffer Chemical Cold Creek and LeMoyne Sites - Remedial Investigation/Feasibility Study - Mobile County, Alabama - Volume II," Camp Dresser & McKee Inc. (August 27, 1985). [Filed and cited as entry number 2 in 3.7 REMEDIAL INVESTIGATION (RI) - Work Plans and Progress Reports]
3. Cross-Reference: "Amendment to Work Plan for Stauffer Chemical Company Sites - Mobile County, Alabama - Volume II," Camp Dresser & McKee Inc. (August 1, 1988). [Filed and cited as entry number 3 in 3.7 REMEDIAL INVESTIGATION (RI) - Work Plans and Progress Reports]
4. "Bioaccumulation Study Work Plan for Akzo Chemical Inc., Axis, Alabama," Jeffrey Reidenauer, BCM Converse Inc. (October 1988).

4.7 Work Plans and Progress Reports (cont'd.)

5. Letter from Benjamin Moore, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (October 26, 1988). Concerning receipt of the October 1988 "Bioaccumulation Study Work Plan for Akzo Chemical Inc., Axis, Alabama," Jeffrey Reidenauer, BCM Converse Inc.
6. "Addendum to Feasibility Study Report - Stauffer Chemical LeMoyne and Cold Creek Sites," Diane Scott, EPA Region IV (July 11, 1989).

4.9 Proposed Plans for Selected Remedial Action

1. "EPA Announces Proposed Plan," EPA Region IV (July 11, 1989). Concerning the Stauffer Chemical Co. sites.

5.0 RECORD OF DECISION (ROD)

5.1 Correspondence

1. Letter from James Scarbrough, EPA Region IV, to Mariam Tehrani, Akzo Chemicals Inc. (March 17, 1988). Concerning the need for a "letter of request" from Akzo for an extension of their Record of Decision date.
2. Letter from Mariam Tehrani, Akzo Chemicals Inc., to Lee DeHihns, EPA Region IV (March 24, 1988). Concerning a request that the deadline for the Record of Decision be extended to February 1, 1989.

10.0 ENFORCEMENT

10.7 EPA Administrative Orders

1. Letter from Wendy Tisch, Stauffer Chemical Company, to Anne Heard, EPA Region IV (October 15, 1985). Concerning comments on the draft Administrative Order on Consent, In the Matter of Stauffer Chemical Company Sites, LeMoyne and Cold Creek Plans, Mobile County, Alabama.
2. Administrative Order on Consent, In the Matter of Stauffer Chemical Company Sites, LeMoyne and Cold Creek Plants, Mobile County, Alabama, Stauffer Chemical Company, Respondent, Docket No. 86-04-C (January 21, 1986).

10.8 EPA Consent Decrees

1. Letter from Patrick Tobin, EPA Region IV, to Steve Perry, Akzo Chemicals Inc. (October 14, 1988). Concerning the status of the consent decree to be issued by EPA Region IV to Akzo Chemicals Inc. and ICI Americas.

11.0 POTENTIALLY RESPONSIBLE PARTIES (PRP)

11.10 PRP-Specific Correspondence

1. Letter from J.D. Sheehan, Stauffer Chemical Company, to James Orban, EPA Region IV (December 21, 1984). Concerning participation by Stauffer Chemical Company in a remedial investigation and feasibility study at Stauffer's Cold Creek plant.

13.0 COMMUNITY RELATIONS

13.2 Community Relations Plans

1. "Final Community Relations Plan - Stauffer Chemical Company Sites - Remedial Investigation/Feasibility Study," Camp Dresser & McKee Inc. (September 4, 1985).

13.5 Fact Sheets

1. "Remedial Investigation/Feasibility Study Fact Sheet - Stauffer Chemical Company Site - Mobile County, Alabama," EPA Region IV (May 1986).

13.8 Scopes of Work

1. "Statement of Work - Community Relations Plan - Stauffer NPL Sites, Mobile County, Mobile, Alabama," EPA Region IV (1988).

16.0 NATURAL RESOURCE TRUSTEE

16.1 Correspondence

1. Letter from Bruce Blanchard, U.S. Department of the Interior, to Gene Lucero, EPA Headquarters (January 16, 1987). Concerning the results of a preliminary natural resources survey of the Stauffer Chemical Co. Cold Creek Plant site.
2. Letter from Bruce Blanchard, U.S. Department of the Interior, to Gene Lucero, EPA Headquarters (January 16, 1987). Concerning the results of a preliminary natural resources survey of the Stauffer Chemical Co. Axis Plant site.

16.5 Technical Issue Papers

1. "Preliminary Natural Resource Survey - Stauffer Chemical Company LeMoyne Plant, Axis, Alabama," U.S. Fish and Wildlife Service (December 1986).

Section II
Guidance Documents

GUIDANCE DOCUMENTS

EPA Guidance documents may be reviewed at EPA Region IV, Atlanta, Georgia.

General EPA Guidance Documents

1. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, amended October 17, 1986.
2. "Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act; Final Rule and Interim Final Rule and Proposed Rule" (40 CFR Part 136), Federal Register, October 26, 1984.
3. Letter from Lee M. Thomas to James J. Florio, Chairman, Subcommittee on Consumer Protection and Competiveness, Committee on Energy and Commerce, U.S. House of Representatives, May 21, 1987 (discussing EPA's implementation of the Superfund Amendments and Reauthorization Act of 1986).
4. Memorandum from Gene Lucero to the U.S. Environmental Protection Agency, August 28, 1985 (discussing community relations at Superfund Enforcement sites).
5. Memorandum from J. Winston Porter to Addressees ("Regional Administrators, Regions I-X; Regional Counsel, Regions I-X; Director, Waste Management Division, Regions I, IV, V, VII, and VIII; Director, Emergency and Remedial Response Division, Region II; Director, Hazardous Waste Management Division, Regions III and VI; Director, Toxics and Waste Management Division, Region IX; Director, Hazardous Waste Division, Region X; Environmental Services Division Directors, Region I, VI, and VII"), July 9, 1987 (discussing interim guidance on compliance with applicable or relevant and appropriate requirements).
6. "National Oil and Hazardous Substances Pollution Contingency Plan," Code of Federal Regulations (Title 40, Part 300), 1985.
7. Amer[redacted] Public Health Association, American Water Works Assoc[redacted]on, and Water Pollution Control Federation. Standard Methods for the Examination of Water and Wastewater. Washington: APHA, 1981.

8. Analytic Methods for Pesticides, Plant Growth Regulators, and Food Additives. New York: Academic Press, 1963-

9. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health. NIOSH Manual of Analytical Methods (NIOSH 77-157-A), 1977.

10. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

11. U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. Methods for Chemical Analysis of Water and Wastes (EPA-600/4-79-020), March 1983.

12. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Community Relations in Superfund: A Handbook (Interim Version) (EPA/HW-6), September 1983.

13. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. A Compendium of Superfund Field Operations Methods (EPA/540/P-87/001, OSWER Directive 9355.0-14), December 1987.

14. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance Document for Cleanup of Surface Tank and Drum Sites (OSWER Directive 9380.0-3), May 28, 1985.

15. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), September 20, 1986.

16. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Personnel Protection and Safety.

17. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Hazardous Response Support Division. Standard Operating Safety Guides, November 1984.

18. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Federal-Lead Remedial Project Management Handbook (EPA/540/G-87/001, OSWER Directive 9355.1-1), December 1986.

19. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Public Health Evaluation Manual (OSWER Directive 9285.4-1), October 1986.

20. U.S. EPA. Office of Ground-Water Protection. Ground-Water Protection Strategy for the Environmental Protection Agency, August 1984.

21. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Handbook: Remedial Action at Waste Disposal Sites (Revised) (EPA/625/6-85/006), October 1985.

22. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Technology Briefs: Data Requirements for Selecting Remedial Action Technology (EPA/600/2-87/001), January 1987.

23. U.S. Environmental Protection Agency. Office of Research and Development. Hazardous Waste Engineering Research Laboratory. Treatment Technology Briefs: Alternatives to Hazardous Waste Landfills (EPA/600/8-86/017), July 1986.

24. U.S. Environmental Protection Agency. Office of Research and Development. Municipal Environmental Research Laboratory. Biodegradation and Treatability of Specific Pollutants (EPA-600/9-79-034), October 1979.

25. U.S. Environmental Protection Agency. Office of Research and Development. Municipal Environmental Research Laboratory. Carbon Adsorption Isotherms for Toxic Organics (EPA-600/8-80-023), April 1980.

26. U.S. Environmental Protection Agency. Office of Research and Development. Municipal Environmental Research Laboratory. Handbook for Evaluating Remedial Action Technology Plans (EPA-600/2-83-076), August 1983.

27. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Data Quality Objectives for Remedial Response Activities: Development Process (EPA/540/G-87/003), March [redacted].

28. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Guidance on Feasibility Studies under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (EPA/540/G-85/003), June 1985.

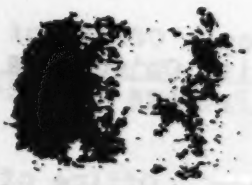
29. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Guidance on Remedial Investigations under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (EPA/540/G-85/002), June 1985.

30. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Interim Guidance on Superfund Selection of Remedy (OSWER Directive 9355.0-19), December 24, 1986.

31. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Test Methods for Evaluation of Solid Waste: Physical/Chemical Methods (SW-846), July 1982.

32. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response and Office of Emergency and Remedial Response. Mobile Treatment Technologies for Superfund Wastes (EPA/540/2-86/003 (f)), September 1986.

33. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response, Office of Emergency and Remedial Response, and Office of Research and Development. Review of In-Place Treatment Techniques for Contaminated Surface Soils - Volume 1: Technical Evaluation (EPA-540/2-84-003a), September 1984.



8. Analytic Methods for Pesticides, Plant Growth Regulators and Food Additives. New York: Academic Press, 1963-

9. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health. NIOSH Manual of Analytical Methods (NIOSH 77-157-A), 1977.

10. U.S. Department of Health and Human Services. National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration. Occupation Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

11. U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. Methods for Chemical Analysis of Water and Wastes (EPA-600/4-79-020), March 1983.

12. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Community Relations in Superfund: A Handbook (Interim Version) (EPA/HW-6), September 1983.

13. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. A Compendium of Superfund Field Operations Methods (EPA/540/P-87/001, OSWER Directive 9355.0-14), December 1987.

14. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Guidance Document for Cleanup of Surface Tank and Drum Sites (OSWER Directive 9380.0-3), May 28, 1985.

15. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Draft Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites (OSWER Directive 9283.1-2), September 20, 1986.

16. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Personnel Protection and Safety.

17. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Hazardous Response Support Division. Standard Operating Safety Guides, November 1984.

18. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Superfund Federal-Lead Remedial Project Management Handbook (EPA/540/G-87/001, OSWER Directive 9355.1-1), December 1986.

29. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Guidance on Remedial Investigations under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) (EPA/540/G-85/002), June 1985.

30. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Interim Guidance on Superfund Selection of Remedy (OSWER Directive 9355.0-19), December 24, 1986.

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33. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response, Office of Emergency and Remedial Response, and Office of Research and Development. Review of In-Place Treatment Techniques for Contaminated Surface Soils - Volume 1: Technical Evaluation (EPA-540/2-84-003a), September 1984.